FALL PREVENTION IN ELDERS:
A PSYCHOEDUCATIONAL MODEL TO REDUCE BRAIN INJURIES

By

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FALL PREVENTION IN ELDERS:
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The purpose of this study was to evaluate the usefulness of the Be HeadSmart® Seniors! fall prevention intervention, HeadSmartz, a Cranium Challenge, in promoting safety behavior change to reduce the risks associated with falls and consequential brain injury sustained among elderly individuals. This intervention incorporated a unique psychoeducational presentation that was delivered through an interactive multimedia presentation and game. This study was based upon Rowe and Kahn's (1997) model of successful aging and DiClemente and Prochaska's (1998) Transtheoretical Model of Behavior change.

Logistic regression, which models the probability of change as a function of covariates and independent variables, was used to determine which variables affected the probability of a participant making a safety improvement change. This type of regression was used to test whether the proportion of safety improvement changes were the same for participants who attended HeadSmartz, a Cranium Challenge, in comparison to the

participants who only received the brochure. The population of interest for this study was individuals who were 60 years of age or older who attended presentations and social activities at local Senior Centers or other related recreational venues. The sampling frame included seniors aged 60 years and older who attended an interactive Be HeadSmart® Seniors! presentation (intervention group) or seniors who received a fall prevention educational packet (comparison). Participants who received the intervention (n=64) reported a statistically significant higher proportion of safety improvement changes when compared with individuals who received the educational packet (n=42).

Fall intervention and prevention programs have been developed and implemented to promote healthy aging. Healthy or normal aging is often affected when an injury is sustained by an individual. Falls and related unintentional injuries are common among elders. Unintentional injuries by the elderly are leading causes of morbidity and mortality sustained by members of this group. Future needs and concerns of this population must be assessed and addressed. This study supports previous research that the use of a multicomponent change strategy can be successful in promoting behavior change, even in areas as complex and multi-factorial as fall prevention and intervention.

CHAPTER 1
INTRODUCTION

Injury prevention is a popular area of research and study. Many interventions have been developed and implemented in injury prevention programs. The purpose of this research study was to investigate and evaluate the use of the Be HeadSmart® Seniors! fall prevention intervention program. This chapter discusses and describes the background of the present study and includes (a) the context of the problem, (b) the conceptual framework, (c) a brief review of the literature, (d) research problem and significance, (e) contribution of planned research, and (f) the research hypotheses.

Context of the Problem

The number of older adults living in the United States has grown exponentially during the 20th century. According to the Federal Interagency Forum on Aging-related statistics (2004), the number of individuals aged 65 or older grew from 3 million to 35 million (1900-2004) (http://agingstats.gov/chartbook2004/default.html). With the onset of the retirement of the Baby Boomer generation, the number of individuals aged 65 and older has been predicted to double. As the number of older individuals continues to grow, our society will encounter new challenges and face a myriad of new issues that are associated with this cohort. Morbidity and mortality associated with unintentional injury are areas of research that need to be examined and addressed. The purpose of this research study was to examine and evaluate an intervention used to reduce risk factors associated with unintentional fall-related injuries.

The Centers for Disease Control National Center for Health Statistics (NCHS) reported that there were 161,269 deaths associated with injury during the year 2002. A total of 53, 464 of these deaths occurred in individuals aged 55 years and older. The number of nonfatal injuries has been reported as 29,237,747. A total of 4,587,013 of these injuries occurred in individuals aged 55 years and older (http://webapp.cdc.gov/ sasweb/ncipc/ mortrate.html). According to the Centers for Disease Control National Center for Injury Prevention and Control, unintentional falls are the leading cause of unintentional injury death in individuals and unintentional injuries sustained by individuals over the age of 65 (http:// www.cdc.gov /ncipc/ osp/ charts.htm).

There are many adverse outcomes that have been linked to falls. These include moderate to severe injuries including bone fracture and traumatic brain injury (TBI). The most commonly reported fractures occur in the hip, forearm, leg or ankle, pelvis, underarm, and hand areas (http://www.cdc.gov/ncicp/factsheet/falls.htm). Falls are a leading cause of TBI (Thurman et al., 1999) and are a leading cause of TBI-related deaths for individuals over the age of 75 (Adekoya et al., 2002). Injuries related to falls sustained by people over the age of 65 have been increasing and more attention is being given to this major public health problem.

Fall intervention and prevention programs have been developed and implemented to promote healthy aging. Healthy or normal aging is often affected when an injury is sustained by an individual. The Centers for Disease Control Healthy Aging Network (HAN) defines healthy aging as "the development and maintenance of optimal physical, mental and social well-being and function in older adults" (http://depts.washington. edu/harn/).

Conceptual Framework

Theory, based from behavioral and social science, provides a platform for understanding why people engage in health-risk or health-compromising behavior and why and how they adopt health-protective behavior. "Understanding the diverse individual, familial, social, and cultural factors that influence an individual's adoption or maintenance of health-compromising behavior can be extremely useful when applied to planning, implementing, and evaluating health promotion programs" (Crosby, Kegler & DiClemente, 2002, p. 2). A vast range of theoretical approaches have been applied to the promotion of health in many different disciplines. The conceptual framework for this study was based upon a combination of the model for successful aging (Rowe & Kahn, 1997) and the Transtheoretical Model of Change (Prochaska, DiClemente & Norcross, 1992).

Rowe and Kahn (1997) define successful aging as "including three main components: low probability of disease and disease-related disability, high cognitive and physical function capacity, and active engagement with life" (p. 433). These components are hierarchical, interrelated, and include subparts. The low probability of disease "refers not only to the absence or presence of disease itself, but also to absence, presence, or severity of risk factors for disease" (p. 433). Physical and cognitive capacities encompass the potential for an activity including what individuals are able to do and what they choose to do. The authors state that "successful aging goes beyond potential; it involves activity" (p. 433). In this model of successful aging, active engagement with interpersonal relations and productive activity were considered to be most important. An

activity is defined as being successful if it "creates a societal value, whether or not it is reimbursed" (p. 434).

The Transtheoretical Model of Change "offers an integrative perspective on the structure of intentional change" (Prochaska, et al., 1992, p. 1102). This model consists of five stages and is organized by three constructs. These constructs are (a) stages of change, (b) processes of change, and (c) levels of change.

Stages of Change

The stages of change in this model "consist of five categories along a continuum that reflect an individual's interest and motivation to alter a current behavior" (Shinitzky & Kub, 2001, p. 179). According to DiClemente and Prochaska (1998), "it is through movement along these stages that one is able to achieve successful behavioral change" (Shinitzky & Kub, 2001, p. 179). The five stages of change are (1) precontemplation, (2) contemplation, (3) preparation, (4) action, and (5) maintenance.

The precontemplation stage is characterized by a lack of recognition of a problem and the unwillingness to make changes in a behavior problem. During the contemplation stage, individuals are aware of the problem but have not made any definitive commitments to make changes in their behavior. Individuals in this stage contemplate the pros and cons of the problem and the consequence of taking actions and making changes in their behavior. Individuals in the preparation stage are "intending to take action in the next month and have unsuccessfully taken action in the past year" (Prochaska et al., 1992, p. 1104). Individuals in this stage have committed to make changes in their behavior but have not yet taken any action. The action stage is the stage in which individuals modify and make changes in their behavior, experiences, or environment. The

maintenance stage is characterized by a continuation of changes that were made during the action stage. The main goal of the maintenance stage is stabilization of behavior change.

Processes of Change

The processes of change allow transition and movement through the five stages of change. Processes of change are either internally mediated or behavioral. Internally-mediated factors are associated with an individual's emotions, values, and cognition (Shinitzky & Kub, 2001). These include consciousness raising, dramatic relief, environmental re-evaluation, social liberation, and self re-evaluation. The five behavioral processes include counter conditioning, helping relationships, reinforcement management, stimulus control, and self-liberation.

Levels of Change

The Transtheoretical Model of Change (TTM) recognizes that problems are not mutually exclusive and have the potential to overlap. The five levels of change incorporated in this model include changes that "relate to the symptoms or situations, maladaptive cognitions, interpersonal problems, family/systems problems, and intrapersonal conflicts" (Shinitzky & Kub, 2001, p. 180). Being attentive to multiple problem factors can assist with tailoring. Tailoring has been referred to as those instances in which the arguments contained in health communications are altered to match the particular concerns of the message recipient (Petty, Barden, & Wheeler, 2002). Tailoring procedures have been used to match not only the types of concerns an individual has about a particular health behavior, but also the individual's stage of behavior change. The

Transtheoretical Model suggests that behavioral changes and messages that match the individual's stage of change are more effective in changing behavior.

Historically, the TTM has been applied to psychotherapy (Padula et al., 2003), used in smoking cessation interventions (Macnee & McCabe, 2004), and used as a method to promote and increase physical activity (Adams & White, 2003; Cardinal, Kosma & McCumbbin, 2003; Resnick & Nigg, 2003). The TTM has also been used as a model with motivational interviewing to promote health and behavior change (Shinitzky & Kub, 2001).

For the purposes of this research study, the conceptual framework focused upon the basic component of the TTM rather than the individual's stages of change. This basic component is based upon the fact that individuals vary in their level of motivation and readiness to engage in new activities and behaviors. Individuals use a variety of strategies to achieve these behaviors. Rosen (2000) states that "the TTM's most original contribution is the premise that different strategies facilitate progress at various points in the process of lifestyle change" (p. 593). The intervention implemented in this study incorporated engagement in social activities (model of successful aging) and attempted to engage individuals to make changes in their health behaviors. In sum, the model of successful aging and the premises of the TTM were chosen to facilitate the understanding of factors that motivated the adoption of a new behavior learned in a social context. A summary of the conceptual framework is diagramed in Figure 1.1.

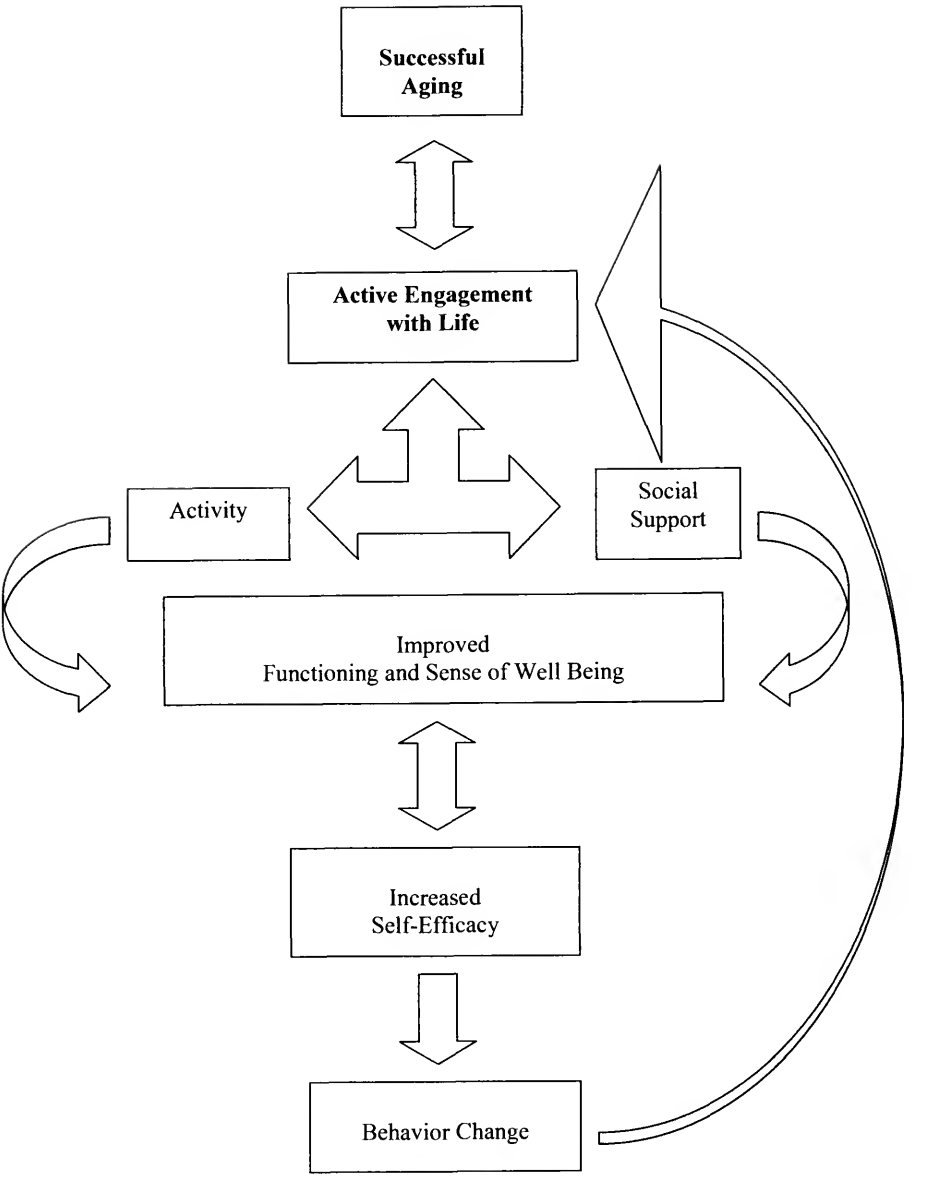

Figure 1.1 Conceptual Framework

Research Problem and Significance

The number of aging Americans is growing at an exponential rate. Many complex and mulit-faceted issues accompany this aging cohort. Unintentional injuries by the elderly are leading causes of morbidity and mortality sustained by members of this group. Future needs and concerns of this population must be assessed and addressed. As this population continues to grow, issues related to falls and fall-related injury will continue to grow (Hart-Hughes, Palacios, Quigley, Scott, & Bulat, 2004).

Rehabilitation counselors facilitate the personal, social, and economic independence of individuals with disabilities and work with people, programs, institutions, and service delivery systems. The primary obligation of rehabilitation counselors is to their clients who are individuals with disabilities who receive services from the rehabilitation counselor (Commission on Rehabilitation Counselor Certification, 2001, Preamble). "If rehabilitation and mental health counselors are to assist aging Americans to cope and adjust to these issues, these counselors need to be able to demonstrate a wide variety of competencies" (Dixon & Richard, 2003, p. 10). In addition, "rehabilitation clinicians must educate themselves on fall risk factors and evidence-based interventions that reduce risks for falls and fall-related injury" (Hart-Hughes et al., 2004, p. 49). Falls and fall-related injuries remain complicated and ever spreading issues are a result faced by all members of the healthcare team. Rehabilitation providers have been trained to deal with many of these complicated issues including mobility deficits and functional limitations. "Rehabilitation and mental health counselors possess valuable skills and expertise that will be highly beneficial in meeting the

contemporary issues facing aging Americans . . . and these counselors should be at the forefront of service delivery" (Dixon & Richard, 2003, p. 10).

Brief Overview of the Literature

The number of older adults living in the United Sates has grown exponentially during the 20th century. With the onset of the retirement of the Baby Boomer generation, the number of individuals aged 65 and older has been predicted to double. As the number of older individuals continues to grow, our society will encounter new challenges and face a myriad of new issues that are associated with this cohort. Morbidity and mortality associated with unintentional injury are areas of research that need to be examined and addressed. The growing number of aging Americans in Florida will be accompanied by new demands on the healthcare system, medical, and rehabilitative social services. One such concern is morbidity and mortality associated with injury among aging individuals. This study was based upon the model of successful aging (Rowe & Kahn, 1997) and used Prochaska and DiClemente's Transtheoretical Model of behavior change.

According to the Centers for Disease Control National Center for Injury Prevention and Control, unintentional falls are the leading cause of unintentional injury death in individuals and unintentional injuries sustained by individuals over the age of 65 (http://www.cdc.gov/ncipc/osp/charts.htm). The consequences of falls among the elderly "are often devastating and include injury, increased morbidity and mortality, loss of independence, fear, decreased activity level, additional treatment expenses and decreased quality of life" (Hart-Hughes et al., 2004, p. 46). Injuries related to falls sustained by people over the age of 65 have been increasing and more attention is being given to this major public health problem. Falls are a leading cause of traumatic brain injury (TBI) in

individuals over the age of 65. The leading causes of TBI are falls (28%), motor vehicle-traffic crashes (20%) and assaults (11%) (Brain Injury Association of America, General Brain Injury Fact Sheet 2005, p. 1). According to the Center for Disease Control (CDC), traumatic brain injury (TBI) is a leading cause of death and disability among children, young adults, and persons older than 75 years of age. The CDC estimates that at least 5.3 million Americans are currently living with the long-term effects associated with TBI (Thurman, et al., 1999).

Fall intervention and prevention programs have been developed and implemented to promote healthy aging and address concerns regarding unintentional injuries sustained by older individuals. Fall prevention and intervention programs have been diverse in structure, content, and delivery. There are many factors that may contribute to falling. These factors are highlighted, addressed, and reviewed in more detail in Chapter 2.

For the purposes of this paper, fall prevention programs reviewed in this study will be grouped into categories based upon the types of fall prevention interventions that were implemented. These interventions include (a) home assessment, (b) exercise regimens, (c) educational information/group learning, and (d) multi-component interventions. Brain Injury Association of Florida (BIAF) is currently implementing a falls prevention program in the State of Florida. Currently, there is limited literature available that discusses fall prevention interventions implemented in the Southeastern United States. In addition, educational fall prevention programs that have been implemented have not included an interactive educational component, which is central in the Be HeadSmart® Seniors! fall prevention program. With the growing body of research

related to fall prevention and intervention, exploration of new intervention techniques and programs is essential.

Contribution of Planned Research

The research outlined in this chapter and described in the following four chapters contributed to the growing body of research that encompasses fall prevention and intervention strategies tailored to reduce fall-related risk factors and related injuries sustained by older members in our community. This study supplemented previous research by adding a specific TBI interactive educational component to a falls prevention program that aims to promote successful aging. This present study investigated if there was a correlation between certain variables and action taken to reduce unintentional fall-related risk factors and consequential injuries.

Research Hypotheses

The purpose of this study was to examine the outcomes of the Be HeadSmart Seniors! fall prevention and intervention program. The overall research question examined in this study was, does the Be HeadSmart® Seniors! intervention affect safety improvement changes (reduce fall risk factors) made by participants? There were seven variables, which led to seven hypotheses that were studied. These variables were related to categories in the conceptual framework of this study and were quantifiable from the data. The research hypotheses were the following:

1. There will be a difference in behaviors between the intervention and the comparison group.
2. Having concerns about falling will be related to behavior change.
3. Having a history of previous falls will be related to behavior change.
4. The willingness to perform safety behaviors will be related to behavior change.

5. Gender will be related to behavior change.

6. Ethnicity will be related to behavior change.

7. Having an individual to assist with making safety changes will be related to behavior change.

Summary

In this chapter, the context of the problem, the conceptual framework, a brief review of the literature, the research problem and significance, the contribution of planned research, and the research hypotheses were addressed. The purpose of this study was to examine the usefulness of an educational and interactive fall prevention intervention to promote health and promote safety improvement behavior changes. The model of successful aging and the Transtheoretical Model of behavior change were used as the conceptual framework for this study.

CHAPTER 2
REVIEW OF THE LITERATURE

The number of older adults living in the United Sates has grown exponentially during the 20th century. With the onset of the retirement of the Baby Boomer generation, the number of individuals aged 65 and older has been predicted to double by the year 2050. As the number of older individuals continues to grow, our society will encounter new challenges and face a myriad of new issues that are associated with this cohort. Morbidity and mortality associated with unintentional injury are areas of research that need to be examined and addressed. The purpose of this chapter was to review the theoretical background associated with this study and to review literature that pertained to (a) aging in America, (b) unintentional injury, (c) traumatic brain injury, (d) the theoretical background associated with this study, (e) fall intervention and prevention programs, and (f) Be HeadSmart® Seniors! intervention program.

Aging in America

The percentage of older adults living in the United States has tripled since 1900 and the population of individuals aged 65 and older is expected to double from the year 2000 to 2030 (Takamura, 1999). The life expectancy of these individuals is also increasing. The number of individuals over the age of 85 has grown 31% since 1900 (Takamura, 1999). The life expectancy for individuals living in the United States has been rapidly increasing and is been expected to reach 83 years for those born in 2050 (Casteel, et al., 2004). An American Association of Retired Persons (AARP) poll of

Americans ages 18 and older revealed that the majority of individuals surveyed expected to live to the age of 80 and would like to live to the age of about 91 (AARP, 1999).

The number of individuals living in the United States over the age of 65 is predicted to increase from approximately 35 million in 2000 to 71 million in 2030. The proportion of the population over 65 years old is projected to increase from 12.4% in 2000 to 19.6% in 2030. The number of individuals age 80 and older is expected to increase from 9.3 million in 2000 to 19.5 million in 2030 (http://www.census.gov/population/www/ projections/ popproj. html.).

In the year 2000, women represented 59% of the population ages 65 and older, and it is estimated that they will represent 56% of this age range in 2030. The number of individuals aged 65 and older who are members of racial minority groups (African American, American Indian/Alaska Native, and Asian/Pacific Islander) are expected to increase from 11.3% to 16.5 % from 2000 to 2030. The number of Hispanic individuals aged 65 and older is expected to increase from 5.6% to 10.9% from 2000 to 2030 (http://www.census.gov/ population /www/projections/popproj.html.).

According to the US Census Bureau, there are 36,293,985 individuals over the age of 65 living in the United States. Florida has the second largest population of individuals older than 65. Second only to California, the US Census Bureau reports that 2,927,583 individuals over the age of 65 reside in the State of Florida (http://www.census.gov/popest/states/asrh /SC-est2004-01.html). By the year 2025, it is projected that "26% of Florida's population will be over the age of 65" (Centers for Disease Control, 2003a, p. 101-106). The growing number of aging Americans in Florida will be accompanied by new demands on the healthcare system, medical, and

rehabilitative social services. One such concern is morbidity and mortality associated with unintentional injury among aging individuals.

Unintentional Injury

The Centers for Disease Control National Center for Health Statistics (NCHS) reported that there were 161,269 deaths associated with injury during the year 2002. A total of 53,464 of these deaths occurred in individuals aged 55 years and older. The number of nonfatal injuries has been reported as 29,237,747. A total of 4,587,013 of these injuries occurred in individuals aged 55 years and older (http://webapp.cdc.gov/sasweb/ncipc/ mortrate.html).

The CDC defines a nonfatal injury as "bodily harm resulting from an acute exposure to an external force or substance (i.e., mechanical, thermal, electrical, chemical, or radiant) and drowning (fatal and non-fatal) including intentional, violence-related, and undetermined causes" (http://www.cdc.gov/mmwr/PDF/SS/SS5307.pdf).

Table 2.1 Intent of Injury for Nonfatal Injuries other than Gunshot Injuries

Assault, confirmed or suspected:	Injury from an act of violence where physical force by more than one person is used with intent of causing harm, injury, or death to another person; or an intentional poisoning by another person.
Legal intervention:	Injury or poisoning caused by police or other legal authorities, including security guards, during law enforcement activities.
Self-harm, confirmed or suspected:	Injury or poisoning from a deliberate violent act inflicted on oneself with an intent to take one's own life or with the intent to harm oneself.
Unintentional:	Injury or poisoning that is not inflicted by deliberate means.
Violence-related:	Injury or poisoning inflicted by deliberate means.

(MMWR, 2003, Surveillance for Fatal and Non Fatal Injuries United States, 2001).

In addition to the intent of injury, there are 22 mechanisms of nonfatal injury. The mechanism of nonfatal injury is classified as "the precipitating cause or the mechanism that started the chain of events leading to the injury (Annest & Pogostin, 2003). The

precipitating causes are classified by using narrative descriptions of the incident and categorized into one of the 22 mechanisms of injury categories. For the purposes of this study, the top 10 respective mechanisms of nonfatal injury associated with unintentional injuries reported for adults over the age of 65.

Table 2.2 Mechanism of Injury

Fall:	Injury received when a person descends abruptly as a result of force of gravity and strikes a surface at the same or lower level.
Struck by/against:	Injury resulting from being struck by (i.e., hit) or crushed by a human, animal, or inanimate object or force other than a vehicle or machinery; injury caused by striking (i.e., hitting) against a human, animal or inanimate object or force other than a vehicle or machinery.
MV-traffic occupant:	Injury to a driver or passenger of a motor vehicle caused by a collision, rollover, crash, or other event involving another vehicle, on abject, or a pedestrian and occurring on a public highway, street or road.
Overexertion:	Working the body or a body part too hard, causing damage to muscle, tendon, ligament, cartilage, joint, or peripheral nerve.
Cut/pierce/stab:	Injury resulting from an incision, slash, perforation, or punctures by a pointed sharp instrument, weapon, or object.
Other bite/sting:	Injury from a poisonous or non poisonous bite or sting through the skin, other than a dog bite.
Poisoning:	Ingestion, inhalation, absorption through the skin, or injection of so much of a drug or toxin, or other chemical that a harmful effect results.
Other transport:	Injury to a person boarding, alighting, or riding in or on all other transport vehicles involved in a collision or other event with another vehicle, pedestrian, or animal not described previously.
Unknown/unspecified:	Injury for which the emergency department does not provide enough information to describe the injury.
Other specified:	Injury associated with any other specified cause that does not fit another category.

(MMWR, 2003, Surveillance for Fatal and Non Fatal Injuries United States, 2001).

Falls

According to the National Center for Injury Prevention and Control, unintentional falls are the leading cause of unintentional injury death in individuals and unintentional injuries sustained by individuals over the age of 65 (http://www.cdc.gov/ncipc/osp/charts.htm). In 1998, the number of unintentional fall-related deaths sustained by

individuals ages 60 and older was reported to be 664 in the State of Florida. This number climbed to 1,037 in the year 2002 (www.cdc.gov/ncipc/wisqars/). The national nonfatal injury rate per 100,000 was reported to be 1,841,575 in the year 2000. This number increased to 2,124,817 in the year 2004 (www.cdc.gov/ncipc/wisqars). The CDC defines a fall-related injury as an injury received when a person descends abruptly as a result of the force of gravity and strikes a surface at the same or lower level.

The consequences of falls among the elderly "are often devastating and include injury, increased morbidity and mortality, loss independence, fear, decreased activity level, additional treatment expenses and decreased quality of life" (Hart-Hughes et al, 2004, p. 46). Physical, emotional, and psychological traumas are serious consequences from falls and can include serious injury, permanent disability, a heightened fear of falling, and loss of confidence mobility, and the capacity for independent living (Casteel et al., 2004). Falls have been associated with decreases in physical and social functioning which can result in depression, fear of falling, and other psychological problems. An individual may experience a loss of self-confidence, social withdrawal, confusion and loneliness (World Health Organization, 2005). A fall has been defined as "a symptom of multiple underlying diseases, the effects of certain medications on homeostasis, and/or environmental hazards or obstacles that interfere with safe mobility" (Guelich, 1999, p. 16).

Risk factors. Approximately one out of three individuals aged 65 or older falls each year, and of those who fall, 20% to 30% sustain moderate to severe injuries that reduce mobility and independence and increase the risk of premature death (Stevens & Olson, 2000). Falls resulting in major injuries may include fractures, brain injuries, and

soft tissue injuries. Some risk factors associated with falling are increasing age, weakening of muscles, gait and balance deficits, functional limitations, environmental hazards, use of medications, and a history of previous falls (Stevens & Olson, 2000). Observational studies have shown that falls in community-dwelling elders are associated with several of these factors, and appear to result from the accumulated effect of these and multiple risk factors (Brown, Gottschalk & Van Ness et al., 2005).

Gender. Women are more likely to sustain a nonfatal fall-related injury when compared to men. Stevens and Sogolow (2005) quantified gender differences for nonfatal fall-related injuries among US adults aged 65 years and older treated in hospital emergency departments (ED). Data were analyzed from a nationally representative sample of ED visits from January 2001 through December 2001. Approximately "1.64 million older adults were treated in EDs for unintentional fall related injuries and 1.16 million, or 70.5% of these injuries were women" (Stevens & Sogolow, 2005, p. 115). Stevens and Olson (2005) stated that "older adults are hospitalized for fall-related injuries five times more often than they are for injuries from other causes, and that women are nearly three times more likely than men to be hospitalized for fall-related injury" (p. 2).

Ethnicity. Many studies have suggested that ethnicity is associated with falling. According to Tinetti (1994), white race was identified as a risk factor for falling. The World Health Organization (2004) stated that "Caucasian ethnic groups fall more frequently than Afro-Caribbeans, Hispanics or South Asians" (p. 7). Substantially higher hospitalization rates have been reported for white women over than age of 65 when compared to African American older women (Stevens & Olson, 2000). Some studies have reported that "Caucasians may fall as much as 50% to 60% more frequently than

African Americans or other ethnic groups" (Faulkner, Cauley & Zmuda et al., 2005, p. 1774). In a study conducted by Faulkner et al., (2005), fall incident rates and the circumstances were examined. Rates and circumstances of falling were compared between older community-dwelling Caucasian and African American women. Circumstances associated with falling included fall location (indoors vs. outdoors), fall surfaces (ice, snow, or dirt vs. indoor floor surfaces), fall direction (forward, laterally, or posteriorly), and if the fall included hand or wrist involvement. Results of their study revealed "ethnic differences in fall circumstances, but not in fall rates that were identified in older Caucasian and African-American community dwelling women" (p. 1777). Differences in fall circumstances were attributed to the different ways in which older Caucasian and African American women fall. Some studies, but not all, have suggested that ethnicity is associated with nonfatal fall-related injuries sustained by individuals over the age of 65.

History of previous falls and concerns about falling. Having a history of previous falls has been identified as a risk factor associated with falling. A history of falls is "associated with increased risk and older adults who fall once are two to three times more likely to fall again within the year" (World Health Organization, 2004, p. 6). Having a history of previous falls increases the risk of a future fall, which has been linked to a fear of falling, limitation of activity, and functional decline (Tinetti, 1994). According to Delbaere et al., (2004), one of the major consequences of fear of falling and the history of previous falls is "the restriction and avoidance of activities, but this may lead the elderly to become more cautious, which may be functional in preventing falls"

(p. 368). This author reported that only a small percentage of elderly displayed a pattern of excessive fear and a restriction of activities.

The psychological effects associated with falling "often result in a fear of falling which in itself is a risk factor for future falls and can greatly reduce an individual's quality of life" (Casteel et al., 2004, p. S52). Having "concerns about falling, regardless of fall status, can lead to deterioration in perceived health status and is associated with poor social function that threatens autonomy and quality of life" (Brouwer et al., 2003, p. 833). According to Tinetti (1994), fear of falling may adversely affect functional independence and is common among elderly persons who have, and have not, experienced a fall. In sum, a review of the literature indicated that having a history of previous falls and concerns about falling have been associated with potential fall incidence and risk.

Social Support. Social relationships and support have strong influences on an individual's health and well-being. It has been "noted that isolation, bereavement, and lack of social integration are related to increased mortality risk" (Berkman, Oxman & Seeman, 1992, p. 196). Falls and related injury are a result of mortality risk. The lack of a social support system has been linked to a higher rate of falls among the elderly (Tideiksaar, 2003).

Previous research has supported the concept that social integration may protect against falls (Faulkner, Cauley & Zmuda et al., 2003). Berkman, Glass, Brissette and Seeman (2000), provided an assessment of social networks that measured social integration and described social integration as the web of social relationships that surrounds an individual. This web was determined to provide opportunities for social

support, influence, engagement, contact with others, and access to resources (Faulkner et al., 2003). Results of this study indicated that social integration may be a protective factor in reducing falls.

Previous research studies have shown that social networks were associated with fall risk reduction (Horsten, Mittleman & Wamala et al., 1999), while other studies have not shown a reduction in fall risks with the presence of social support (Studentski, Duncan & Chandler et al., 1994). A large prospective study of older community-dwelling Caucasian women evaluated the relationship between social integration and fall risk (Faulkner et al., 2003). Results of this study found that "stronger social ties may reduce the risk of falls among elders" (p. 958). It is also important to mention that not all social support promotes health. For example, "social support that increases the older persons feelings of low self-esteem, lack of competence, or autonomy and dependence may be potentially damaging" (Berkman et al., 1992, p. 200). In sum, a review of the literature indicated mixed findings in regards to social support and the reduction of fall risk and related injury.

Physical Consequences of Falling

A major concern and consequence of falling is physical injury. Two predominant areas of physical injury associated with falling are fracture and traumatic brain injury. Fractures are a common consequence of unintentional fall-related injuries sustained among older adults. According to the CDC, roughly 3% to 5% of older adult falls result in fractures, and this translates to 360,000 to 480,000 fall-related fractures each year (http://www.cdc.gov/ ncipc/factsheets/falls.htm). According to Scott (1990), the most common fractures are of the vertebrae, hip, forearm, leg, ankle, pelvis, upper arm, and

hand. According to the National Osteoporosis Foundation (2005), "osteoporosis is responsible for more than 1.5 million fractures annually, including: over 300,00 hip fractures; and approximately 700,000 vertebral fractures; 250,000 wrist fractures; and 300,000 fractures at other sites" (National Osteoporosis Foundation, 2005, p. 2). The rate of hip fractures is up to three times higher in women than men; however, one year mortality following a hip fracture is twice as high for men when compared to women (http://www.nof.org/osteoporosi/diseasefacts.htm).

More attention has been given to hip fractures when compared to other osteoporosis- related fractures. This is due to "more complete epidemiological information that is available and because hip fracture accounts for the majority of direct medical costs to the community" (Johnell & Kanis, 2004, p. 897). The World Health Organization (2004) estimates that "at least 95% of hip fractures are caused by falls and these fractures comprise approximately 25% of fractures resulting from falls in the community" (p. 6).

Falls are the leading cause of Traumatic Brain Injury (TBI) in individuals over the age of 65. Falls account for 28% of TBIs sustained annually. Motor vehicle crashes and assaults account for 20% and 11% of TBIs, respectively (http: //www.biausa.org/word. files.to.pdf/good.pdfs/generalbraininjuryfactsheet2005.pdf). According to the Centers for Disease Control, traumatic brain injury (TBI) is a leading cause of death and disability among children, young adults, and persons older than 75 years of age. In the United States, it is estimated that 5.3 million women, men and children are living with permanent TBI-related disabilities (http://www.cdc.gov/ncipc/fact_book/factbook.htm).

One study in 1985 estimated that the annual cost associated with TBIs to be approximately $37.8 billion (Thurman, 1999). In 1995 economic costs associated with TBI were estimated to exceed $56 billion (CDC, 2003b).

The different definitions that have been associated with TBI and the various methods of collecting TBI data make it difficult to compare data from multiple sources, hence, making it difficult to estimate the true national incidence of TBI (CDC Traumatic Brain Injury Surveillance Program, 1989-1998). For the purpose of this study, the following definition was used:

> an occurrence of injury to the head that is documented in a medical record, with one or more of the following conditions attributed to head injury: observed or self-reported decreased level of consciousness, amnesia, skull fracture, objective neurological or neuropsychological abnormality, or diagnosed intracranial lesion; or as an occurrence of death resulting from trauma, with head injury listed on the death certificate, autopsy report, or medical examiner's report in the sequence of conditions that resulted in death (CDC, 2002a, p. 19).

In 1996, the Traumatic Brain Injury Act (Public Law 104-166) was passed and authorized State surveillance systems to obtain information about TBI incidence and prevalence in the United States. This information included the number of people who sustain a TBI, the causes of the injury, and the severity associated with the TBI (http://www.cdc.gov/ doc.do/id/0900f3ec8001011c). Findings in this surveillance program indicated that non-fatal TBIs were more frequent than deaths associated with TBI. "The leading causes of TBI varied by age in the seven states" with falls being the

leading cause of TBI sustained by individuals aged 75 years or older at a rate of 126.6 per 100,000 (Thurman et al., 1999, p. 609).

The most recent article based on state-based TBI surveillance data reported that "this article is part of the first study developed from an ongoing surveillance system that is tracking TBI, and this study examines hospital discharge data for people who survived a TBI that resulted in hospitalization in fourteen states" (http://www.cdc.gov/mmwr/preview/mmwr html/mm 5213a3.htm).

Between the years of 1996 and 1999 the total numbers of fall-related hospitalizations were reported to be 29,761. A total of 28,009 (94%) of these patients were discharged and 1,752 patients died while being hospitalized. "A total of 1,252 (71%) of fatal fall-related TBI hospitalizations were among those aged ≥65 years" (CDC, 2003b, p. 276).

Traumatic Brain Injury in General

Approximately 1.4 million individuals in the United States sustain a TBI each year. According to the CDC, over 5.3 million individuals are living with the long-term effects of a traumatic brain injury and approximately 320,000 (2%) of Florida's total population is living with these long-term effects. The Florida Statute defines TBI as an "insult to the skull brain or it's covering, resulting from external trauma which produces an altered state of consciousness or anatomic, motor, sensory, cognitive or behavioral deficits" (Florida Statute, § 381.745). Traumatic brain injury is a subset of acquired brain injury. Acquired brain injury includes brain injury resulting from birth trauma, near drowning, brain tumors, strokes, and other brain-related disorders.

There are several different types of traumatic brain injury that are dependent upon the amount, type, and force of impact upon the head. These types of injuries can be either focal or diffuse. A focal or penetration injury occurs when there is trauma from a single point of entry such as a knife or gunshot wound. A diffuse injury occurs when many different areas of the brain are affected. An example of this type of injury is coup/Contrecoup, which occurs when the force impacting the head "is not only great enough to cause a contusion at the site of impact, but also is able to move the brain and cause it to move and impact the opposite side of the skull" (http://www.biausa.org).

Table 2.3 Types and Characteristics of Traumatic Brain Injury

Diffuse Axonal Injury	This type of injury is caused by shaking or strong rotation of the head. There is extensive tearing of nerve tissue in the brain which disrupts communication and chemical processes. This can produce temporary or permanent brain damage. An example is Shaken Baby Syndrome.
Concussion	This is the most common form of TBI. This type of injury can be caused by direct blows to the head, focal and diffuse injuries. The blood vessels in the brain may expand and this can result in cranial nerve damage. The individual may or may not lose consciousness and skull fracture, bleeding, or swelling may or may not be present. A concussion may cause a diffuse axonal type injury. Typical recovery time is from a few months to a few years.
Contusion	This can be caused by a direct impact to the head resulting in bleeding in the brain.
Coup-Contrecoup Injury	This type of injury results from contusions that occur at the site of impact and on the opposite side of the skull.
Second Impact Syndrome "Recurrent TBI"	This type of injury occurs before the symptoms of the first TBI have dissipated. It is more likely to cause brain swelling and widespread damage.
Penetration Injury	Injury occurs from the impact of a bullet knife or other sharp object that penetrates the skull and forces hair, skin, bone and fragments in the brain.

Brain Injury Association of America, Retrieved October 2005 from, http://www.biausa.org/ Pages/ types_of_brain_injury.html

In addition to the types and characteristics of TBI, there are three different classification levels of traumatic brain injury. These levels include mild, moderate, and severe traumatic brain injury. Emergency responders typically use the Glascow Coma Scale and the Rancho Los Amigos Scale to assess the severity of the TBI. The Glascow Coma Scale is used to rate the level of degree of unconsciousness of the individual. The Rancho Los Amigos Scale is used to rate an individual's level of cognition and recovery.

Table 2.4 Levels of Traumatic Brain Injury

Mild Traumatic Brain Injury	A mild TBI is characterized by brief (a few seconds to a few minutes) or no periods of unconsciousness. This type is only diagnosed when the individual appears dazed, confused or loses consciousness. This change in mental status is indicative of altered brain functioning and is referred to as a concussion.
Moderate Traumatic Brain Injury	A moderate TBI is characterized by a loss of consciousness from a few minutes to a few hours. This is followed by days or weeks of post-traumatic amnesia.
Severe Traumatic Brain Injury	A severe TBI is characterized by a prolonged period of an unconscious state or coma that lasts days, weeks, or longer. This type is further categorized into subgroups with separate features.

Brain Injury Association of America, Retrieved October 2005 from, http://www.biausa.org/ Pages/ types_of_brain_injury.html

There are many consequences associated with traumatic brain injury. These can include physical, cognitive, and psychosocial consequences. Some examples of physical consequences are paralysis on one side of the body, defective muscle and motor coordination, double vision, headaches, seizures, and hemanopsia or partial blindness in an individual's field of vision. Cognitive difficulties can include difficulty with attention, concentration, memory, organization and planning, problem solving, and judgment. Psychosocial consequences of TBI can include a change or loss of social supports and networks, which can be accompanied by feelings of isolation and depression. In sum, TBI

is a multi-faceted and complex injury that has unique incidence, prevalence, and consequence. Thus far aging in America, unintentional injuries, and traumatic brain injury have been reviewed. The theoretical background associated with this study will now be described and the chapter will conclude with a review of current fall prevention literature and the Be HeadSmart Seniors! fall prevention program.

Theoretical Background

Health promotion theories provide a platform for understanding why people engage in health-risk or health-compromising behavior and why and how they adopt health-protective behavior. Theories can be used to inform, explain, or predict behaviors, and help us gain insight into possible determinants of behavior change (Brug, Oenema & Ferreria, 2005). The concept of successful aging encompasses different perspectives. The two main perspectives that exist are a) successful aging is a state of being and is a condition that can be objectively measured at a certain moment and b) aging is a process of continuous adaptation (Faber, Bootsma-van der Weil, Exel et al., 2001). Rowe and Kahn's (1997) model of successful aging focuses on successful aging as an outcome (Menec, 2003), and offers characteristics of individuals who have aged successfully and are actively engaged with life. They describe successful aging as the positive extreme of normal aging (Faber et al., 2001). More specifically, Rowe and Kahn's (1997) model includes low probability of disease and disease- related disability, high cognitive and physical functional capacity, and active engagement with life (p. 433). Engagement with life involves "activity and social support" (Everard, Lach, Fisher & Baum, 2000, p. 208). Activity theory emphasizes "a link between activity and well being and suggests that both the frequency of participation in activities and their level of intimacy are important for

life satisfaction" (Menec, 2003, p. S74). Engaging in social activities has been associated with an increased sense of well being (Everard et al., 2000). Active engagement with life can encompass many activities performed in daily life. Rowe and Kahn (1997) focus on interpersonal relations and productive activity. Interpersonal relations "involve contacts and transactions with others, exchange of information, emotional support, and direct assistance" (p. 433-434). Productive activity is defined as activities that create a societal value. These activities may or may not have monetary reimbursement. Productive activities can include volunteer work, such as caring for a family member with a disability or volunteering at a local church (Herzog & Morgan, 1992).

The relationship between active engagement with life and the functioning of older adults was examined by Everard et al., (2000) and included both activity and social support. Their study included leisure activities in addition to social and productive activities. They also examined the relationship of engagement, as activity and social support, and compared it to the functioning in older adults. They argue that "the relationship of activity to social support and functioning can be important in the development of early interventions to prevent disability or enhance successful aging" (p. S209). Findings in their study revealed that there is a relationship between active engagement and functioning. Maintenance of social, leisure, and instrumental activities were associated with better functioning. The authors suggest that these findings indicate that activity may be a modifiable factor in successful aging, and that disability and health care costs could be reduced by utilizing an early intervention.

The Transtheoretical Model of behavior change (TTM) developed originally from a comparative analysis of behavior change and psychotherapy. This model "is a

comprehensive psychological model that integrates important constructs from other behavioral theories with an innovative approach to conceptualizing behavior change as occurring in distinct stages" (Fahrenwald & Walker, 2003, p. 307). The TTM was initially applied to psychotherapy, and later applied to smoking cessation, other addictive behaviors, exercise and physical activity promotion interventions, and various aspects of dietary change. Over the last decade, the application of the model has rapidly expanded to include a broad range of health behaviors (Rossi & Rossi, 1999).

The TTM has been used to understand and explain the stages that older individuals move through when making changes in behavior. It is "the changes in the cognitive and behavioral processes that are used to influence health-related behaviors" (Resnick & Nigg, 2003, p. 81). According to the TTM, "individuals that adopt behaviors move through the stages of Precontemplation, Contemplation, Preparation, Action and Maintenance" (p. 81). Individual behavior change is cyclical and integrates their intention to maintain or change their behavior.

The TTM "integrates behavior change constructs with the core construct stages of change which include self-efficacy, decisional balance, and 10 processes of behavior change classified as experiential and behavioral processes of change (Fahrenwald & Walker, 2003, p. 308). Self-efficacy refers to the beliefs a person holds regarding their abilities to perform an action. Decisional balance refers to an individual's decision to perform an action based upon perceived pros versus cons. If there is a greater perception of pros, then the individual is more likely to adopt or perform that behavior. Experiential change processes are applied during the earlier stages of change (precontemplation, contemplation, and preparation). Behavioral processes of change "are most important

when initiating and performing health behavior in the later stages of change" (p. 309). The later stages include the action and maintenance stages. Resnick & Nigg (2003) offer that "stage of change may be particularly useful to determine the most appropriate intervention or technique to facilitate change" (p. 86). Conceptually, "the stages of change seek to capture the temporal, motivational, and constancy dimensions of behavior change" (Cardinal, Kosma & McCumbbin, 2004, p. 869). This study was based upon the model of successful aging (Rowe & Kahn, 1997) and used Prochaska and DiClemente's Transtheoretical Model of behavior change.

Health behavior change and the older adult. Preventative health behaviors and practices are essential for an older adult's well-being and continues to be a popular topic of interest for researchers. The number of individuals aged 65 and older residing in the United States is increasing, and projected demographics indicate a continual increase over the next several decades. Preventive health practices, defined as daily routine behaviors performed to promote health and prevent illness, have been associated with decreased disability and mortality. According to Breslow and Breslow (1993), "older adults with poor health practices experienced 50% greater disability and mortality when compared to those with a pattern of good health practices" (Gallant and Dorn, 2001, p. 21). Positive health practices have been linked to better preventive health behaviors including health behavior change.

Several factors that influence health behavior change have been identified in previous studies, but "little is known about general population prevalences of older adults' efforts to change behavior, motivations to improve behaviors, and perceived barriers to change (Newsom, Kaplan & Huguent et al., 2004, p. 193). Health behaviors

have been defined as behaviors that involve any action made by individuals that have potential consequences for physical or psychological functioning (p. 194). Studies that examined the relationship between older adult's health behavior and self-reported behavior change will now be reviewed.

The association between health beliefs and health behavior change in older adults was examined by Ferrini, Edlestein, and Barrett-Connor (1994). Their study investigated the "relationship between health-related attitudes and health behavioral changes in an elderly population to determine how health promotion efforts to change diet and exercise patterns were perceived by an educated health-conscious cohort" (p. 1). Positive health-related beliefs were based upon the Health Belief Model, which links positive health beliefs with the motivation to change behavior. Five health-related beliefs were identified in this study and their relationship to self-reported health behavior change was examined.

Individuals recruited for the study were placed into the "younger respondents" group (ages 50-69) or into the "older respondents" group (70 years and older). Results of the study indicated that increasing age did not diminish the relationship between health behaviors and beliefs, but as the age of the respondents increased (aged 70 and older), the number of reported health behavior changes decreased. The older respondent group also reported higher levels of confusion when they were making behavioral changes to remain healthy. Those "who reported confusion about how to stay healthy or lack of motivation to engage in healthful behaviors were found to be less likely to make positive lifestyle behavioral changes" (p. 1). The article concludes by suggesting that health promotion campaigns and interventions that target older adult's populations could benefit by striving

to reduce confusion, and that this reduction could improve health behavior and promote behavior change in this cohort.

Gallant and Dorn (2001) examined factors that influenced the practice of positive daily health behaviors in a sample of older adults (aged 60 years and older) and investigated "whether explanatory factors differed by health behavior, gender, or race" (p. 21). Dependent variables that were examined in this study included physical activity, weight maintenance, smoking, alcohol consumption, and sleep patterns. Independent variables that were examined included demographic characteristics, baseline health behavior, health status variables, psychological factors, and social network characteristics.

Age and health status were found to be important predictors of preventive health behaviors. Interestingly, "the factors that predicted preventive health behaviors and behavior change were found to vary by behavior, gender, and race" (p. 21). Social network variables were found to be most influential in women's health behavior and health status was found to be most influential among men's health behavior. Higher levels of education were found to predict better health behavior among Caucasian participants, while formal social integration was found to be an important predictor of health behavior of black women. The results of this study suggested that the examination of older adults' health behaviors and behavior change by race and gender contributed to a better understanding of these behaviors.

The prevalence of health behavior and preventive-care activities, self-reported behavior change, and perceived barriers to change were estimated in a population-based study of adults aged 60 or older by Newsom, Kaplan & Hugent et al. (2004). Findings in

their study revealed that "a substantial proportion of older adults lead relatively inactive lives and often fall short of recommended standards for preventive health-care visits and screening tests and . . . nearly two thirds (63.2%) of older adults reported no efforts in the prior year to make changes to improve their health, and 66.7% of these older adults indicated that they thought no changes were needed" (p. 193). This finding is consistent with previous research findings that have suggested that improvement is needed in the areas of health behavior change and preventive practices among older adults (Newsom et al., 2004).

Results of the by Newsom et al. (2004) study indicated differences in prevalence estimates of health behaviors and preventative care practices in the areas of gender, age, and education. Females were found to have healthier lifestyles when compared to men. Younger adults reported higher levels of drinking and smoking when compared with older adults. Education was found to be the most consistent factor with health-related behaviors, and the relationship of education to health behaviors "appeared to be independent of a variety of other factors" (p. 203). The authors suggested that higher levels of education may be associated with better access to health information. It was also suggested that individuals with more education may have a better ability to evaluate the risks or benefits to health when performing health behavior lifestyle changes. The authors concluded that older adult education and intervention programs needed to convince older adults to change behaviors by emphasizing the benefits of healthy behaviors and performing associated behavior changes.

Preventive health behaviors and practices are essential for an older adult's well-being, and positive health practices have been linked to better preventive health behaviors

including health behavior change. Several factors that influence health behavior change have been identified. Prevention and intervention programs can be implemented to promote positive health practice and facilitate behavior change. As mentioned previously, one out of three older adults' falls each year and many of these individuals sustain moderate to severe injuries, including traumatic brain injury. Fall prevention and intervention programs have been implemented to reduce related injuries and fall-risks by promoting positive health practices and by facilitating health behavior change. Fall prevention and intervention programs, specific to older adults, are reviewed in the following section.

Fall Intervention and Prevention Programs

Fall intervention and prevention programs have been developed and implemented to promote healthy aging. The Healthy Aging Research Network (HARN) defines healthy aging as "the development and maintenance of optimal physical, mental and social well-being and function in older adults" (http://depts.washington.edu/harn/). Healthy or normal aging is often affected when an injury is sustained by an individual. Research has suggested that the process of healthy or normal aging may be adversely affected by the occurrence of a traumatic brain injury (TBI). According to Hinkebein, Martin, Callahan, and Johnstone (2003), "individuals with a history of moderate-to-severe TBI may be more vulnerable to the impact of the normal aging process" (p. 1040). The mission of the Healthy Aging Research Network is to "better understand the determinants of healthy aging in older adult populations; to identify interventions that promote healthy aging; and to assist in the translation of such research into sustainable community-based programs throughout the nation" (http://depts. washington.edu/harn/).

Falls are a leading cause of TBI in individuals over the age of 65. Fall prevention and intervention programs have been diverse in structure, content, and delivery. There are many factors that may contribute to falling. A fall has been defined as "a symptom of multiple underlying diseases, the effects of certain medications on homeostasis, and/or environmental hazards or obstacles that interfere with safe mobility" (Guelich, 1999, p. 16). Falls may be a result of intrinsic or extrinsic factors or a combination of these factors. Intrinsic factors have been defined as "characteristics that are inherent to each individual and that are the result of changes relating to aging, disease or medication" (Tideiksaar, 2003, 201). These can include neurological, sensory, and musculoskeletal impairments. Extrinsic factors can include "environmental hazards as well as activity-related factors" (p. 201). These can include uneven and slippery floor surfaces, inadequate lighting, and cluttered walkways. There is a higher risk for falling when more of these factors are present.

For the purposes of this paper, fall prevention programs reviewed in this study were grouped into categories based upon the types of fall prevention interventions that were implemented. These interventions included (a) home assessment, (b) exercise regimens, (c) educational information/group learning, and (d) multi-component interventions.

Home assessment. The use of home safety assessments in the prevention of falls among older people was examined in Queensland, Australia. These assessments included fall prevention strategies, including education and awareness-raising, exercise, home modifications, and medical assessment, and were examined as part of a randomized trial of falls prevention among community-dwelling elders (Peel, Steinberg & Williams,

2000). Two hundred and fifty-two volunteers of the National Seniors Association participated in the trial. Participants were divided into four groups with two groups receiving the intervention (home assessment) and two groups not receiving the intervention (control). Occupational therapists used a Home Safety Checklist during the assessments and recommended actions to improve home safety.

A baseline questionnaire was used to collect data at the beginning of the trial. Data were collected one year after the intervention was delivered. Results showed that a significant number(59%) of the home assessment group made at least one modification to their home environment when compared with the control group (32%). The article concluded by stating "while not demonstrating that home safety assessments and modifications significantly reduced falls and injuries in the population studied, other benefits such as improved confidence attributable to awareness of such fall prevention measures were recorded" (p. 539).

The cost effectiveness of a home hazard reduction program to reduce falls among older persons was conducted in 1999 in Sydney, Australia. The main objective of this study was "to estimate the cost effectiveness of just one component of a multi-factorial approach to falls prevention" (Salkeld et al., 2000, p. 265). The one component utilized in this study was a home hazard reduction program. An occupational therapist assessed individual homes for environmental hazards and supervised the completion of any recommended modifications. Participants in the intervention group received the home assessment, while participants in the control group did not receive any assessment. The results of this study implicated that the single factor home hazard reduction program was more to be cost-effective amongst older people who have a history of falls.

Steven, Holman, Bennett, and De Klerk (2001) performed an outcome evaluation of a randomized control trial to prevent falls sustained among older people. The aim of the randomized control trial was "to evaluate the outcome of an intervention to reduce hazards in the home on the rate of falls in seniors" (p. 1448). A total of 570 participants were in the intervention group. These individuals were offered a home hazard assessment, information on hazard reduction, and the installation of safety devices. Members of the control group did not receive information on home hazard reduction or the installation of any safety devices. Members of both groups were instructed to record the incidence of falls on a daily calendar. More specifically, participants of both groups were asked to record the number of falls that occurred each day, and the location, mechanism, and time associated with each fall. Results generated in the study indicated that "the intervention failed to achieve a reduction in the occurrence of falls" (p. 1448). Reasons cited for this failure were that the intervention strategies "most likely had a limited effect on the number of hazards in the homes of intervention subjects" (p. 1448).

Exercise. In a study by Reinsch et al. (1992), participants in several senior centers "participated in a standardized low-intensity exercise program and were instructed in behavioral strategies to increase safety" (Tinetti, 1994, p. 757). Data were collected at these centers and compared to data collected at a senior center that did not receive the exercise program or behavioral strategy instruction. The results of this study did not indicate any differences between the control and intervention groups in the occurrence of falls or fears associated with falling.

The Frailty and Injuries Cooperative Studies of Intervention Techniques (FICSIT) trials (1993) indicated more promising findings in their studies (Tinetti, 1994). FICSIT

research initiatives sponsored multicenter trials supported by the National Institute on Aging and the National Institute for Nursing Research. A total of eight independent clinical trials were implemented to determine the effects of unique intervention strategies on fall prevention. Findings in one FICSIT study revealed a 25% reduction fall rate among participants who received the Tai Chi intervention. Results in another FICSIT study indicated that individuals who were assigned to the intervention group received a multiple factor risk abatement strategy. Participants who received this intervention were compared to individuals who did not receive the intervention. Results in this study indicated that there was a 30% reduction in fall rate amongst the intervention group during the one year follow-up after receipt of the intervention (Tinetti, 1994).

A falls prevention research group conducted four controlled trials of a home exercise program to prevent falls in older people (65-97 years old) residing in nine cities and towns in New Zealand. A meta-analysis was performed on the individual data that was collected during these trials. The objective of the analysis was "to estimate the overall effect of the exercise program on the numbers of falls and fall-related injuries and to identify subgroups that would most benefit from the program" (Robertson, Campbell, Gardner & Devlin, 2002, p. 905).

The intervention used in the study was an individually prescribed home exercise regimen. The home exercise intervention program included a set of muscle, strength, and balance exercises and a walking schedule. Each set of exercises were individually prescribed in the participant's home by trained health professionals. Individuals who received the intervention were expected to perform the exercises three times per week and walk twice during the week. The meta-analysis performed in this study "showed that

the specifically developed, individually tailored home exercise program used in these studies reduced both falls and fall-related injuries in community living older adults by 35%" (Robertson et al., 2002, p. 909).

Education material, presentation and group learning. An impact evaluation of a falls prevention program among older people, "Up and About", was conducted in Australia in 1999. The aim of this evaluation study "was to assess the impact of peer-presented education sessions on the falls-related attitude, knowledge and behavior of older people (Deery, Day & Fildes, 2000, p. 428). The term peer refers to the trained elderly persons who presented the fall prevention information to other members of the elderly population. The article states that "it was expected that peer educators would establish strong rapport with older members of the community and thus effectively educate them to identify and modify their activities and hazards in the environment to prevent falls" (p. 428). In sum, the primary goal of this study was to examine the impact of education sessions on older people's fall-related attitudes and behavior. The material presented during these information sessions focused on raising awareness about falls and prevention. Three specific focus areas included raising awareness or changing attitudes in: "(1) how falls can be prevented; (2) risk factors for falling; and (3) modifying hazards in the home or yard to prevent falls" (p. 428). The intervention groups consisted of individuals who attended the information sessions. The members of the control group did not attend the information sessions. Participants in the intervention group reported installing more fall-prevention features in their home and yard. They also reported taking more fall prevention actions when compared with the control group.

Clemson et al. (2004) conducted a randomized trial was conducted to evaluate the effectiveness of a community-based falls prevention program in Australia. The objective of the study was "to test whether Stepping On, a multifaceted community-based program using a small-group learning environment, is effective in reducing falls in at-risk people living at home" (p. 1487). The Stepping On program "aims to improve self-efficacy, encourage behavioral change, and reduce falls" (p. 1487).

All participants in the study received a baseline assessment. This assessment included "a background questionnaire covering the demographics, health status, fall history, and a functional measure of mobility and balance" (p. 1488). Participants were randomized into intervention and control groups. Individuals in the intervention groups received the Stepping On Program. This program "uses a small-group learning environment to improve fall efficacy, encourage behavioral change and to reduce the occurrence of falls" (p. 1488). The overall aim "was to facilitate older subjects taking control, explore different coping behaviors, and encourage follow-through on safety strategies in their daily lives" (p. 1488).

The results of this trial indicated that "the intervention group experienced a 31% reduction in falls" (p. 1487). This significant finding indicates that the Stepping On program was successful in reducing the amount of falls occurring among the community-dwelling participants in this study. The article concludes by stating "the results of this study renew attention toward the idea that cognitive-behavioral learning in a small group environment can reduce falls" (p. 1493).

Multi-dimensional interventions. Rubenstein, Robbins, and Josephson (1990) performed a random clinical trial to assess falls in the elderly population. The

intervention utilized in this study "consisted of a multidimensional consultation with recommendations such as physical therapy referral or medication adjustment made to the participant's primary care provider" (Tinetti, 1994, p. 757). The results of this study were accompanied by many limitations and did not indicate successful prevention of falls with use of their intervention.

In a study by Murlow, Gerety, Kanteen et al. (1994), physical therapists attempted to reduce the incidence of falls by performing a "multi-dimensional assessment and intervention strategy that aimed at improving the strength, range of motion, mobility and ADL performance of residents at several nursing homes" (Tinetti, 1994, p. 758). The results of the study did not indicate that this assessment and intervention strategy was successful in reducing the incidence of falls sustained by nursing home residents.

In a study by Hornbrook et al. (1994), older individuals were studied in a large HMO organization. Participants in the study were randomized into a study group in which they were administered an intervention (safety information). This safety information included exercise programs and encouraged participants to adopt behavioral strategies to promote safety in their environment (Tinetti, 1994). The group given the intervention was compared to another group that did not receive the safety information. The results of the study indicated that the "intervention group experienced marginal decreases in the odds ratio (0.85) but only reduced the average number of falls among those who fell by 7%"(Tinetti, 1994, p. 758).

A population-based randomized trial was performed to test a multi-component intervention program in 1994. The aim of the randomized and controlled trial was to evaluate the effectiveness of a disability fall prevention intervention administered to

HMO enrollees. A total of 1559 ambulatory seniors were randomly assigned into one of three groups. One group (n=635) received an assessment from a visiting nurse and received follow-up interventions targeting risk factors related to falls and disability. The second group (n=317) received a visit from a nurse and was given general health promotion information. The third group (n=607) received usual care (Wagner et al., 1994). The results of the study showed "that after 1 year Group 1 subjects reported a significantly lower incidence of declining functional status and a significantly lower incidence of falls when compared to Group 3 subjects" (p. 1800). The subjects in Group 2 were reported to have intermediate outcomes. Results after the two-year follow-up showed a narrowing of these differences.

Another randomized controlled trial was conducted in 1999 aimed to "ascertain whether a structured bi-disciplinary assessment of elderly people, who live in the community and attend an accident and emergency department with a primary diagnosis of a fall, could alter outcome and decrease the rate of falls during a 12-month follow-up period" (Close, Ellis & Hooper et al., 1999, p. 93). The intervention group "underwent a detailed medical and occupational-therapy assessment with referral to relevant services if indicated" (p. 93). The participants in the control group received usual care. Findings in this study indicate that "there were significantly fewer falls in the intervention group than in the control group . . . and that the intervention group had a lower risk of falling when compared to the control group" (p. 96).

In 2001, a falls prevention program was implemented to evaluate the impact of an intervention to reduce environmental hazards in the home. The intervention was delivered by registered nurses to community-based seniors (over 70 years of age) living in Perth,

Australia. Components of the intervention consisted of a home hazard assessment, an educational strategy on general falls reduction and ways to reduce identified home hazards, and the free installation of safety devices, such as grab rails, non-slip stripping on steps, and double-sided tape on floor rugs or mats (Stevens, Holman & Bennett, 2001). An educational pamphlet designed to illustrate the role of home hazards and falls and to provide modification and removal information was given to members of the intervention group. Members of the control group did not receive a home hazard assessment or intervention.

Eleven months after the intervention was administered, members of the intervention group and members of the control group were sent postal questionnaires. The questionnaire that was sent to the intervention group "asked each participant to describe any actions that were taken in response to removing up to three home hazards and the changes to hazards and behaviors which resulted from the general advice offered in the educational pamphlet" (p. 1444). The questionnaires that were sent to the members of the control group asked them to document "changes to home hazards and hazardous behaviors made since their commencement in the study" (p.1444). The responses reported by members of the intervention group were assessed and the change in the prevalence of home hazards was "measured by repeating the home hazard assessment in the homes of a random sample of the study subjects" (p.1444).

Data collected from members of the control group were also evaluated. Hazard prevalence was assessed at baseline and at 11 months later in a random sample of 51 homes. The results of the study indicated that "all homes had at least one fall hazard and that the intervention was associated with a small but significant reduction in four of the

five most prevalent hazards" (p.1442). The most prevalent hazards reported were floor rugs, stepovers (ledge of bath/shower), steps, and trailing cords. Safety devices were installed in "81.9% of the homes and the advice given on modification of specific hazards resulted in over 50% of subjects removing these hazards" (p. 1442).The home hazard reassessment also indicated that there "had been a significant reduction in four or five of the most prevalent hazards" (p. 1445). The members of the control group reported less action taken to reduce hazards when compared to the control group (15.8% v. 74.4% respectively).

The effectiveness of a home-based fall risk reduction program for rural community-dwelling older adults was evaluated in Montana in 2001.The goal of this program "was to provide healthcare workers and communities with a primary prevention tool that can be used to teach seniors about fall related risks" (Yates & Dunnagan, 2001, p. M227). A total of 40 participants between the ages of 67 and 90 were recruited from senior centers located in four rural southwest Montana towns. Educational brochures were given to older individuals who attended these senior centers. Thirty-seven of the 40 originally recruited participants were randomly assigned into an intervention or control group. All participants in the study participated in a home-based interview and physical assessment administered by one of the researchers in the study (Yates & Dunnagan, 2001).Members of the intervention group were administered a four-part-program to reduce fall-related risk factors over a period of ten weeks. The four parts of the intervention included fall risk education, exercise programming, nutritional counseling/referral, and environmental hazard education. After the completion of the 10-

week intervention, members of both the intervention and control groups were given a post-test (Yates & Dunnagan, 2001).

Analysis of the data revealed statistically significant changes for the intervention group on "balance, bicep endurance, lower extremity power, falls efficacy, reduction of environmental hazards, and nutritious hazards" (Yates & Dunnagan, 2001, p. M229). No statistically significant positive changes were reported to be observed in the control group. The major limitation that the authors report is that "the multi-factorial nature of the intervention makes it difficult to tell which aspects of the program facilitated the significant changes" (p. M230).

A randomized factorial trial of falls prevention among older people living in their own homes was conducted in Melbourne, Australia. The objective of the trial was "to test the effectiveness of, and explore interactions between, three interventions to prevent falls among older people" (Day, Fildes & Gordon et al., 2002, p. 128). The three interventions implemented in this randomized control trial were a) a group based exercise, b) home hazard management and c) vision improvement. These interventions were delivered to eight groups defined by the presence or absence of each intervention. Seven of these groups received "at least one intervention and the eighth group did not receive an intervention until after the study had been completed" (p. 128).

Participants in this study received a home visit and were administered a baseline questionnaire. The baseline questionnaire included information about demographics, ADLs, social activities, support services, health self-reports, and prescription information. A specific method was used to assess each participant's targeted risk factors (strength, balance, poor vision, and presence of home hazards). Once the targeted risk

factors had been assessed, participants were "then assigned (by computer generated randomization) to an intervention group by an independent party via telephone" (p. 129). Eighteen months after the baseline assessment, risk factor assessments were randomly repeated among a proportion of the participants. Participants were required to record falls on a monthly postcard calendar and report any occurrence of falls to the research assistant.

Data collected in this study were analyzed by calculating the "changes in levels of risk factors by comparing measures at baseline with those at the end of the study for the randomly selected participants" (Day, Fildes & Gordon et al., 2002, p. 130). Results of this study indicated that "the strongest effect was observed for all three interventions combined (rate ratio 0.67 (0.51 to 0.88), P=0.004), producing an estimated 14.0% reduction in the annual fall rate" (p. 128). A significant effect was observed for combinations of interventions that involved exercise with improvements in balance measures being most significant. The authors concluded by stating that "group based exercise was the most potent single intervention tested, and the reduction in falls among this group seems to have been associated with improved balance" (p. 128). The addition of home hazard management or reduced vision management also reduced the chances of falling. In the end, it was the combination of all three interventions that produced the greatest reduction in the number of falls experienced by the participants in this study.

A Home Intervention Team (HIT) was utilized to prevent falls in community-dwelling frail elders in southern Germany. The objective of the randomized FALLS-HIT trial was "to evaluate the effect of an intervention by a multidisciplinary team to reduce falls in older people's homes" (Nikolaus & Bach, 2003, p. 301). Participants were

recruited from a geriatric clinic in southern Germany. Recruited participants in the intervention group were randomly assigned to "comprehensive geriatric assessment and post-discharge follow-up home visits from an interdisciplinary HIT or comprehensive geriatric assessment (CGA) with recommendations followed by usual care at home" (p. 301). Participants in the control group received a CGA but did not receive a home visit.

The home intervention implemented in this study consisted of a home assessment, identification of environmental hazards, advice about hazard removal/modification, and training relating to the use of technical and mobility equipment. The home intervention was implemented by the HIT at baseline and "an additional home visit was made after three months to reinforce any recommendations that had been made during the initial home visit" (Nikolaus & Bach, 2003, p. 300). After one year, a home visit was made to individuals in the intervention and control groups. After twelve months, a total of 163 and 204 falls were reported in the intervention and control groups, respectively, therefore intervention reduced reported falls by "31%" (p. 303). The authors concluded by stating that "this study has demonstrated that a home intervention based on home visits to assess for environmental hazards, provide information about possible changes, facilitate any necessary home modifications, and teach the use of technical and mobility aids when necessary is effective in a subgroup of frail older individuals with a high risk for repeated falls" (p. 304).

A randomized trial to reduce the fear of falling in seniors was implemented in Canada in 2003. The objective of the trial was to "determine the relative effect of education and activity programs on fear of falling, balance, strength, and health status" (Brouwer, Walker, Rydahl & Culham, 2003, p. 829). One intervention group received

activity program sessions while the other intervention group received an educational program. These programs were "designed to reduce the fear of falling" and were delivered on a weekly basis for a period of 8 weeks" (Brower et al., p. 829).

The activity program sessions included a warm-up, low resistance exercises, and ended with a 10-minute cool down. Individuals in this group were encouraged to follow a bi-weekly, 40-minute home program of exercises and stretching, which was illustrated in an exercise booklet. Participants in the education program were instructed to discuss their concerns about falling. They were also encouraged to discuss topics that were related to the identification and reduction of fall-related risk factors. These included environmental hazards in and around their homes. The importance of proper nutrition, footwear, and activity were also discussed. Each participant received "an informational manual which covered each of the topics that were discussed and included listings of community resources for seniors" (p. 830).

Analysis of the data indicated that the fear of falling was reduced in both programs. Participants in the activity program showed improvements in balance while members who received the education intervention "showed modest declines" (Brower et al., 2003, p. 829). The authors also reported that "gains in perception of health status were limited to physical health in the activity group and mental health with the education group" (p. 829). In sum, the findings in this article indicated that improvements in balance confidence are not intervention-specific and that a logical approach to reduce the fear of falling should "incorporate aspects of both activity and education programs" (p. 834).

In 2004, the effectiveness of a falls prevention program was performed in California. The objective of this study was to evaluate the effectiveness of the "No More Falls" (NMF) older adult fall prevention program. This community-based older adult falls-prevention intervention study aimed to reduce the prevalence of falls in the community and to describe compliance to the NMF program.

The Department of Health Services (DHS) developed a health promotion and disability prevention program for California's older adult population in 1973. This program is called Preventative Health Care for the Aging (PHCA). The NMF intervention program was implemented in 1998 by the PHCA. Consumers of the PHCA were screened and enrolled in the NMF program. The initial screening identified known risk factors that are associated with falling. Individuals who possessed two or more of these factors were invited to participate in the NMF program.

Consumers of the PHCA participated in a one-hour comprehensive review, which encompassed their health history, physical wellness, and nutritional habits. Following the review, the individuals received an individualized health plan that targeted identified health-risk behaviors and reflected the client's attempts to change these habits. The plan also promoted incorporation of appropriate fall prevention activities. All PHCA clients underwent routine follow-ups to ascertain if the goals and interventions of the individualized health plan were being met. Follow-ups were also used to" indicate the experience of any adverse health outcomes associated with the plan" (Casteel et al., 2004, p. S55).

Components used in this intervention program were intended to address fall-related risk factors associated with environmental hazards, medical management, alcohol

use, physical activity, and hearing and vision impairments. Intervention approaches utilized in this study "are intended to achieve consistent and effective implementation of the intervention" (p. S53). These interventions were well defined and included: "(1) assessment of identified risks; (2) counseling to identify fall risks; (3) education about falls in simplified terms, (4) referral to health services and community programs;(5) development of a NMF plan with the participant; (6) reassessment of the intervention plan; and (7) reinforced maintenance of positive risk reduction strategies including rewards for completion of planned activities" (p. S53).

The authors summarized the effectiveness of the NMF program to reduce falls among its participants based upon three comparisons. These included a) the odds of falling were reduced among those enrolled in the NMF program; b) falls decrease approximately 50% among program participants 1 year post intervention; and c) NMF program participants with "higher compliance to their fall-prevention program had a greater reduction in their odds of falling" (p. S57). Advantages and disadvantages were then highlighted and the article concluded by stating that "this study shows that programs, such as the NMF, can effectively compliment healthcare systems, compliance to these programs can be high, and fall occurrence can be reduced" (Casteel et al., 2004, p. S59).

An evidence-based program to prevent patient falls was implemented in five Veterans Administration Fall Clinics in the state of Florida. The goals of these Fall Clinics were to "assess severity of fall risk, establish the etiology of falls and develop a specific plan of care" (Hart-Hughes et al., 2004, p. 46). Interdisciplinary Fall Clinical Teams provided individualized care plans for Veterans who were determined to be at risk

for falls and related injuries. These teams evaluated Veterans by assessing their risk for falls, postulated the etiology of falls, and created individual fall risk reduction plans.

Fall risk reduction plans incorporated the implementation of intervention by the Fall Clinical Teams. These interventions included, "the issuing of various types of prosthetic equipment, consultation to other specialty services (i.e. neurology), prescription to an individualized home exercise regimen, and the ordering of various diagnostic tests such as blood tests etc . . ." (p. 48). Medical management recommendations were made to the participant's primary care providers and a home safety assessment checklist was used to examine environmental hazards in the home.

Data were collected during the initial clinical visit and three months later via follow-up telephone calls. During the follow-up call, information including participant's incidence of fall, near falls, current functional status, and adherence to treatment recommendations and plans were recorded. The results of this study indicated "statistically significant reductions in the number of falls were reported by patients on three month follow up when compared to pre-intervention values" (p. 49). This article concludes by stating the need for rehabilitation clinicians to "become familiarized with fall risk factors and with evidence-based interventions that encompass fall intervention and prevention" (p. 49).

Chang, Morton, Rubenstein et al., (2004) performed a systematic review and meta-analysis of randomized fall prevention and intervention clinical trials. Their objective was "to assess the relative effectiveness of interventions to prevent falls in older adults to either a usual care group or control group" (p. 680). The authors selected four categories of fall-prevention intervention programs to systematically review. These

categories included a) multi-factorial falls risk assessment and management programs, b) exercise programs, c) environmental modification programs and d) educational interventions.

A multi-factorial falls risk assessment and management program was defined as "a focused post-fall assessment or systematic risk factor screening among individuals at risk tied to interventions and follow up" (p. 680). Exercise programs "included both general and specific physical activities with general activities including walking, cycling and aerobic movements" (p. 680). Specific general activities included training specific to balance, gait, and strength. Environmental modification programs often include home visits to check for environmental hazards were accompanied with recommendations for modification and possible assistance with implementation of these modifications. Educational interventions were defined as interventions that " target individuals, groups, or communities, and could vary from pamphlets and posters at senior centers and nursing homes to more intensive interventions such as one to one counseling about risk factors" (p. 680).

The authors reviewed current and relevant literature and identified 40 trials. Information was gathered from trials that met the major inclusion criteria. These inclusion criteria consisted of "studies that focused in falls prevention, randomized control trials, data on participants over the age of 60 years, and inclusion of a usual care or control group" (p. 681). Data that were collected in the study design and the study quality were assessed with the Jadad score.

Analysis of the data revealed that "a multi-factorial falls risk assessment and management program was the most effective component on risk of falling (0.82, 0.72 to

0.94) and monthly fall rate (0.63, 0.49-0.83; 11.8 fewer falls in treatment group per 100 patients per month)" (p. 680). Analysis also indicated that exercise interventions were successful in reducing fall risk and monthly fall rate. The conclusion of this systematic review and meta-analysis indicated a dual pronged approach to falls prevention (p. 683). More specifically, "implementing a multi-factorial falls risk assessment and management program would be most feasible by targeting selected people, such as those with a history of falls" (p. 683).

Be HeadSmart®Seniors! Brain Injury Association of Florida (BIAF) is implementing a falls prevention program in the State of Florida. Currently, there is limited literature available that discusses fall prevention interventions implemented in the southeastern United States. In addition, educational fall prevention programs that have been implemented have not included an interactive component which is central to the Be HeadSmart® Seniors! fall prevention program. This program is unique in that it incorporates the use of an interactive educational component, specific to TBI and fall prevention, which is delivered via a PowerPoint presentation. In a recent article by Austin-Wells, Zimmerman, and McDougall (2003), it was stated that "PowerPoint presentations address pragmatic, sensory, and environmental concerns much more efficiently than overhead projectors or flip charts" (p. 500). The current fall prevention program incorporates the use of PowerPoint and an interactive educational component.

BIAF is a non-profit organization whose mission is to improve the quality of life for persons with brain injury and their families by creating a better future through brain injury prevention, research, education, support services, and advocacy (www.biaf.org). BIAF's Be HeadSmart® Seniors! Program is devoted to preventing brain injuries by

helping seniors identify potential dangers, and find the resources needed to make improvements to their homes (i.e., installing grab bars, improved lighting, easy access to work and storage areas), driving skills, and health (careful monitoring of medications and regular vision exams). As part of the program, BIAF has developed an entertaining and interactive educational event called, HeadSmartz A Cranium Challenge, which is offered free to seniors in the State of Florida during 2004-2005.

The HeadSmartz Cranium Challenge is based upon the popular board game Cranium™ which incorporates a variety of activities that stimulate various parts of the brain. The HeadSmartz Cranium Challenge is delivered to two to four teams with three to four members on each team. The players of each team earn points by answering trivia questions and word games, humming or whistling, charades and more. The Cranium Challenge is presented in a PowerPoint Presentation that is projected onto a screen or wall and is accompanied by music and moving images. Prior to the game, players are given a study sheet that includes facts and information about brain injury and how to prevent a fall and reduce risks associated with falling.

All players and audience members are given the Be HeadSmart® Seniors! safety brochure. This brochure provides information about TBI and includes a safety checklist and a "Make a Difference" Safety Improvement Card. The safety checklist is to be used to identify potential improvements seniors can make in their homes and daily lives. The home improvement areas are categorized into specific areas in and around the home. These areas include a) stairways, hallways, and entrances, b) living areas, c) bathrooms and bedrooms. The "my lifestyle" section of the safety checklist include potential

improvements related to a) getting around, b) driving, and c) health in general (refer to Appendix B.).

After the completion of the game, all players and audience members are asked to review the safety check list and complete the "Make a Difference" improvement card. This card asks individuals to fill in two safety improvements that they plan to perform in the future. Individuals are also asked to fill in their name and telephone number for follow-up. Follow-up calls are made within a few weeks after the individuals have attended the HeadSmartz Cranium Challenge. A brief survey questionnaire is used during follow-up telephone calls. Contacted individuals are asked if they had performed the improvements that they had listed on the "Make a Difference" card. General feedback questions are asked regarding the presentation and the information presented in the HeadSmartz Cranium Challenge. Information obtained during the follow-up phone calls was recorded and later entered into an EXCEL spreadsheet. The completed spreadsheet was then imported into SPSS 11.0 for analysis.

Pilot data were collected from the Be HeadSmart Seniors! intervention program during August 2004-June 2005. The effectiveness of prevention activities in the Be HeadSmart Seniors program and the HeadSmartz Cranium Challenge were analyzed and reported. Effectiveness measures were based upon telephone survey results included responses from 385 participants. These individuals were asked questions pertaining to brain injury and the actions that were taken to reduce fall-related risks and consequential brain injury. A total of 323 or 84% contacted individuals reported that they completed at least one of the actions that they had initially committed to perform. Pilot data indicated that a significant number of safety actions were taken and that an overwhelming number of

participants found the program useful and informative. A total of 282 individuals (73%) reported that they found this presentation useful and informative. A total of 371 individuals (96%) would recommend this presentation to other individuals.

A substantial number of individuals referred to the safety information and shared this information with other individuals after attending the Cranium Challenge. A total of 109 individuals reported that they had shown or discussed the list with an individual who did not attend the HeadSmartz Event. A total of 84 respondents (22%) stated that they had referred to the checklist after attending the HeadSmartz Presentation. In addition, a substantial number of individuals who attended the presentation reported that they were more likely to be proactive to avoid injury after attending the Cranium Challenge. Respondents in the telephone survey were asked if they were more likely to take action to avoid falls and brain injury after attending the presentation. A total of 319 (83%) individuals reported that they were more likely to be proactive about their safety by taking action to avoid falls and consequential brain injury. These findings revealed a link between this prevention program and positive impacts and actions made in association with participation and observation of the Be HeadSmart® Seniors! program.

Summary

In summary, this chapter discussed the historical background found in the literature related to (a) aging in America; (b) unintentional injuries, falls, and traumatic brain injury; (c) the theoretical background associated with this study; (d) fall intervention and prevention programs; and (e) be HeadSmart Seniors! intervention program. Injuries related to falls sustained by people over the age of 65 have been increasing and more attention is being given to this major public health problem. Fall

intervention and prevention programs have been developed and implemented to promote healthy aging. There is a growing need for more valid and reliable information and data collection pertaining to the impact of fall prevention and intervention programs and their efficacy in the reduction of fall-related injuries.

Traumatic brain injury and related behavior change was examined through an integrative model of successful aging and a transtheoretical model of behavior change. The components of normal and successful aging were described and supported by the literature. Various variables related to behavior change for people who participated in previous fall prevention intervention programs were explored and reviewed. Finally, a unique TBI fall prevention and intervention program was reviewed.

CHAPTER 3
METHOD

The purpose of this study was to evaluate the usefulness of the Be HeadSmart® Seniors! fall prevention intervention in promoting safety behavior change to reduce the risks associated with falls and consequential brain injury sustained among elderly individuals. In this chapter, the (a) research design, (b) sampling strategy, (c) intervention, (d) group assignment, (e) instrumentation, (f) variables, (g) procedures, and (h) data analysis are introduced.

Research Design

The research design incorporated in this study utilized a quasi-experimental two-group design. Changes in safety behavior were observed in the intervention and comparison groups in order to determine the utility of the Be HeadSmart® Seniors! intervention to promote behavior change. Specifically, the research hypotheses were the following:

1. There will be a difference in behaviors between the intervention and the comparison group.
2. Having concerns about falling will be related to behavior change.
3. Having a history of previous falls will be related to behavior change.
4. The willingness to perform safety behaviors will be related to behavior change.
5. Gender will be related to behavior change.
6. Ethnicity will be related to behavior change.

7. Having an individual to assist with making safety changes will be related to behavior change.

Sample

The population of interest for this study was individuals who are 60 years of age or older who attended presentations and social activities at local Senior Centers or other related recreational venues. The sampling frame included seniors aged 60 years and older who attended an interactive Be HeadSmart® Seniors! presentation (intervention group) or seniors who received a fall prevention educational packet (comparison). One hundred sixty-one participants were eligible for inclusion in this study. Of these, 55 individuals were excluded due to the inability to contact these individuals through the follow-up telephone survey. Twenty-nine of the individuals who were excluded received the intervention and 26 of these individuals only received the informational brochure. Therefore, the number of individuals eligible for participation in the study was 106. Eighty-six of these individuals were female and 20 were male. Of the 106 individuals included in this study, 83 individuals were Caucasian and 23 of these individuals were other minority, non-white. A more in-depth descriptive analysis is provided in Chapter 4.

Convenience sampling was used in this study. This is a non-probability sampling approach, which included the collection of data from a substantial number of people to increase the power of finding relationships and behavior change.

The type of sampling strategy utilized in this study incorporated the use of nonequivalent posttest-only comparison group design. This strategy facilitated static group comparison and allowed for the identification of confounding factors that were present in this study. Static comparison does allow for some measure of comparison in that it includes a comparison group. Historically, this type of comparison has been

viewed as being inherently weak for the illumination of causal relationships. This is a consequence of threats to internal validity, due to selection bias and attrition, and the lack of group equivalence before implementing an intervention. Therefore, a multiple logistic regression analysis accompanied this study and helped to determine if there was a relationship between the presence of a group attribute and the measured response.

Intervention

Currently in Florida, an educational fall prevention and intervention program, which highlights the risk of serious brain injury for people over the age of 60, is provided under the auspices of Brain Injury Association of Florida. Falls are the leading cause of injury and death among people over the age of 60 and are the leading cause of traumatic brain injury (Brain Injury Association of America, 2005).

The Be HeadSmart® Seniors! prevention program incorporated the presentation of HeadSmartz, a Cranium Challenge. This intervention used a unique and interactive educational component that was tailored for fall prevention and consequential traumatic brain injury. This presentation was delivered through multi-modal components that capitalized on all avenues of sensory intake.

The Cranium Challenge is an interactive, visual, and auditory program based upon the popular board game Cranium™. This game stimulated various parts of the participant's brain through trivia questions and word games verbally, visually, or by humming, whistling, or playing charades. The presentation included trivia questions created in a PowerPoint presentation that addressed facts about prevalence, incidence, and prevention of falls that can result in traumatic brain injury. The goal of this intervention was to foster motivation to change fall risk-related behavior. Austin-Wells,

Zimmerman, and McDougall (2003) stated that "PowerPoint presentations address pragmatic, sensory, and environmental concerns much more efficiently than overhead projectors or flip charts" (p. 500).

Two to four teams are formed consisting of four players on each team. Each player and audience member was given an educational packet that included a safety checklist for fall prevention, information about traumatic brain injury, a safety improvement card that was completed by individuals who attended the presentation, and information about Brain Injury Association of Florida and its role in prevention of falls and consequential traumatic brain injury. The Cranium Challenge was presented, trivia questions were asked, and points were awarded to teams who correctly answered the questions. The team with the most points was awarded a token at the conclusion of the presentation. Tokens included canvas tote bags, magnifier bookmarks, or $5 gift certificates to a local bookstore to promote brain-stimulating activity. At the end of the presentation, all of the participants and members of the audience completed a safety improvement card (refer to Appendix A), which included changes in behavior that they planned to implement in or around their homes or activities in their daily lives. Individuals were informed that follow-up telephone calls would be made within six weeks to obtain feedback about the presentation, to find out if the listed behavior changes have been implemented, and to confirm demographic information included in the surveys.

Group Assignment

An informational flyer announcing the Be HeadSmart® Seniors! program was sent to several senior centers in northeast and central Florida. Centers were pre-selected

as either only offering the presentation or only offering the information packet. A sign-up sheet was posted alongside the announcement at each venue. There is a potential bias of self-selection, which is a major limitation with this type of sampling and group assignment.

Participants who attended the Be HeadSmart® Seniors! presentation were assigned to the intervention group. This group participated in HeadSmartz, a Cranium Challenge. Participants in this study who only received fall prevention education information and materials were assigned to the comparison group.

Participants in both groups were presented with an IRB-approved informed consent form before they were recruited for inclusion in this study. Participants were instructed to review the consent form carefully before they decided to participate in the study. The informed consent explained the purpose of the research study, explained what the participant would be asked to do in the study, and explained the risks and benefits anticipated in the study. Participants were informed that there would be no compensation for participating in the study and that their identity would be kept confidential. Participants were also informed that their participation was voluntary and that there would be no penalty for not participating in the study. They were also informed that they had a right to withdraw from the study at any time without consequence. Contact information was provided for participants who may have questions about the study or their rights as a research participant in the study. All participants received a copy of the informed consent after agreeing to participate in the study.

Instrumentation

This section describes the instruments that were used to collect data.

Safety Improvement Card

The Be HeadSmart® Seniors! "Make a Difference" safety improvement card was one of the instruments used to collect data. This card instructed individuals to review the Be HeadSmart Safety Checklist and instructed them to list one or two things that they could do to reduce their risk of serious injury. In addition, individuals were asked to provide their name, telephone number, and zip code. Individuals were also asked to check either the "60+" or "under 60 years of age" group box. There was a brief disclaimer at the bottom of the card that informed individuals a phone call would be made to them to follow-up with their progress in making safety improvement changes. The bottom of the safety improvement card included a space to record the date and location of the presentation. Completed cards were collected from members of the intervention group at the end of the presentation.

Individuals in the comparison group volunteered to review the safety brochure and fill out the survey card. These individuals attended recreational activities at local Senior Centers. Participants who reviewed the safety brochure had not attended the HeadSmartz presentation or previously received the safety information. Completed cards from the members of the comparison group were collected after they had reviewed the educational informational packets.

Follow-up Survey

Telephone follow-up calls were placed within one month to members of the intervention and comparison groups. This survey began with an introductory statement

and was followed by five closed-ended questions and open-ended sub-questions. These questions addressed safety improvements that were implemented after attending the presentation or receiving the educational informational packets. Questions also addressed concerns about falling, a history of previous falls, willingness to make safety improvements to avoid a fall and related injury, and if the individual had a caregiver or someone to assist them with activities of daily living and to assist with making safety improvement changes.

Variables

The dependent variable for this study was the probability of reducing risk factors for fall-related injuries among the elderly. This was operationalized by tracking whether or not a participant reported making at least one safety improvement change to reduce fall risks and related unintentional injury. Fall risk factors were included in the Be HeadSmart® Seniors! safety brochure. Participants in this study reported making a change or not making a safety improvement change after receiving the intervention or the informational brochure. Making any change or not making a change was the response variable of interest.

Seven independent variables were considered. The primary independent variable of interest was group membership; that is, are there significant differences in safety improvement behaviors performed by participants in the intervention group when compared to safety improvement behaviors performed in the comparison group. The operational definition of this variable was participation in either the intervention or comparison group. This was coded as a numerical and discrete variable. The remaining independent variables in this study were also discrete: gender (male or female), ethnicity

(Caucasian or non-white minority), help with changes (yes or no), concerns about falling (yes or no), history of falls (yes or no), and willingness to perform safety improvement behavior changes (yes or no).

The operational definition associated with the "help with changes" variable was defined as having a caregiver or companion to assist the individual implement safety improvement behavior changes. The "concerns about falling" variable was defined to be "yes" if the individual has concerns about taking a fall and "no" otherwise. If an individual had an occurrence of a previous fall within the past five years, the "history of falls" variable was recorded as a "yes"; otherwise, it was marked as "no." If the individual expressed a willingness to change behavior to increase safety, the "willingness to perform safety behavior changes" was recorded as "yes"; if not, it was recorded as "no."

Procedures

Data for this study were collected after the conclusion of the Be HeadSmart® Seniors! presentation, after the distribution of the educational informational packets, and through the collection of completed "Make a Difference" safety improvement cards (refer to Appendix A). Data were also collected through follow-up telephone surveys.

Data were collected from March 2005 through September 2005. A total of 161 individuals were recruited to participate in this study. A total of 106 were eligible for inclusion in this study. Individuals were eligible if they were over the age of 60, completed the safety improvement cards, and were able to be contacted during follow-up telephone surveys. Additionally, eligible participants had not previously received the

informational brochure or attended HeadSmartz, a Cranium Challenge. The response rate associated with this study was 66%.

Follow-up phone calls were made using a psychosocial survey within six weeks after receiving the intervention or distributing the safety information brochures. At least five telephone call attempts were made to individuals after they received the intervention. Initial phone calls were placed approximately ten to 14 days after participants received the intervention. This time allowed individuals to have an opportunity to perform their intended safety improvement changes. Individuals who were unable to be contacted was due to missing, incorrect, or disconnected telephone numbers or the individual was unable to be reached after five phone call attempts. A more in-depth descriptive analysis is provided in Chapter 4.

Data Analyses

A multiple logistic regression was conducted to determine whether the values of the groups or the independent variables affected the probability of an individual reducing their risks of falling through safety improvement behavior change. Specifically, this regression explored the differences in the probability of safety improvement behaviors performed between the intervention and comparison groups. Of the 106 participants who were eligible for inclusion in this study, seven participants did not answer every survey question. Therefore, the N for the logistic regression was 99.

Logistic regression models the probability of change as a function of covariates and independent variables. The dependent variable was change in behavior that participants performed to reduce their risk of falling. Participants reported making a safety improvement change or not making a safety improvement change. Group

membership was the primary independent variable. Participants who attended the presentation were included in the intervention group. Participants who only received the informational brochure were included in the control group. The covariates of gender, ethnicity, concerns about falling, history of falls, the willingness to make safety improvements, and the presence of a caregiver were evaluated. It is not common to have independent variables that are all categorical, but as with any regression analyses, they can be either continuous or categorical.

There are a total of seven statistical hypotheses that corresponded with the research hypotheses and the operational definition of safety improvement changes to reduce fall risks and related unintentional injury that were made by members of the intervention and comparison groups. These statistical hypotheses were:

- Ho: $p_{intervention} \leq p_{comparison}$, where p is the probability of making a safety improvement change or not making a change
- H_0: concerns about falling do not increase the probability of making a safety improvement change or not making a change
- H_0: history of previous falls does not increase the probability of making a safety improvement change or not making a change
- H_0: willingness to change does not increase probability of making a safety improvement change or not making a change
- H_0: gender is not related to the probability of making a safety improvement change or not making a change
- H_0: ethnicity is not related to the probability of making a safety improvement change or not making a change
- H_0: presence of an individual to help is not related to the probability of making a safety improvement change or not making a change

Statistical Analysis Procedures

Data analysis was performed using SPSS version 13.0. This statistical analysis software program is commonly used to analyze simple and complex data and was the program chosen to analyze data collected in this study.

Logistic regression was used to determine which variables significantly affected the probability of a particular outcome or event occurring. All variables included in this study were binary, having only two possible outcomes. Logistic regression was used to model the probability of safety improvement behavior change, where each person had a chance to make changes to reduce fall risks and related unintentional injury, as a consequence of group membership and the potential values of the covariates.

Binary logistic regression is a type of regression that is applied when the dependent variables are dichotomous and the independent variables are dichotomous, continuous, categorical, ordinal, or interval. This type of regression is used in this study to determine whether each set of independent variables has a unique predictive relationship to the binary dependent variables. "Logistic regression can be used to predict a dependent variable on the basis of independents and to determine the percent of variance in the dependent variable explained by the independents; to rank the relative importance of independents; to assess interaction effects; and to understand the impact of covariate variables" (Garson, 2005, p. 1). In this type of regression, the dependent variable is a logit or the natural logarithm of the odds: log (odds) = logit (p) =ln (p/ (p-1). In logistic regression, the logit is assumed to be linearly related to the independent variable(s): logit (P) = a +bX where a is the regression constant, b is the regression coefficient, and X is the independent variable. According to Hosmer and Lemeshow

(2000) "the logit is the linear part of the logistic regression model and, as such, is most like the fitted line in a linear regression model" (p. 18).

After the transformation of the dependent variable into a logit, a maximum likelihood estimation (MLE) method is performed. This statistical method is used for estimating the coefficients or the probability of certain events occurring. "The method of maximum likelihood yields values for the unknown parameters which maximize the probability of obtaining the observed set of data" (Hosmer & Lemeshow, 2000, p. 8). The Wald statistic was used to test the significance of the individual regression coefficients for each independent variable. This test is obtained by "comparing the maximum likelihood estimate of the slope parameter to an estimate of its standard error" (p. 16). The odds ratio is also reported in a logistic regression. This ratio is a measure of association that approximates how much more likely or unlikely it is for an outcome to be present. According to Hosmer and Lemeshow (2000), "the simple relationship between the coefficient and the odds ratio is the fundamental reason why logistic regression has proven to be such a powerful analytic research tool" (p. 50).

Logistic regression was the method of analyses in this study due to the binary nature of the response variable. "What distinguishes a logistic regression model from the linear regression model is that the outcome variable in logistic regression is binary or dichotomous" (Hosmer & Lemeshow, 2000, p. 1). When a dependent variable is dichotomous, the assumptions underlying regression analysis are violated because the distribution of the errors is not normal but binomial (SPSS, 1999). Additional assumptions underlying regression are also violated when variables are binomial. The assumption of homoscedasticity or the assumption that the variance of Y is constant

across the values of X is violated. Testing of the B weights are based upon the assumption that prediction errors are normally distributed, which is difficult to justify when the Y has the binary values of 0 and 1. Therefore, logistic regression was chosen as the method of analysis for this study.

Summary

In this chapter, the research design, population sample, group assignments, the procedures for data collection, and the intervention used in this study were described. The instruments that were used to collect the data for this study and the variables of interest for this study were examined. Finally, the statistical procedures that were used in the analysis of the data were outlined.

CHAPTER 4
RESULTS

Descriptive Analyses

Participants

One hundred sixty-one participants were eligible for inclusion in this study. Of these, 55 individuals were excluded due to the inability to contact these individuals through the follow-up telephone survey. Twenty-nine individuals who were ineligible for inclusion in the study received the intervention and 26 of these individuals only received the educational packet. Individuals were unable to be contacted due to missing, incorrect, or disconnected telephone numbers or the individual was unable to be reached after five phone call attempts. A total of 106 individuals were included in this study. This return rate of 66% was higher than the national average of survey return rates. In the year 2003, the response rate for telephone surveys was reported to be 48% (Curtin, Presser, & Singer, 2005).

The higher return rate achieved in this study can be justified by strategies that were implemented to increase response rates. These strategies included the brevity of the survey, the affiliation with the University of Florida, the explanation of the survey research and its purpose, and the request to be able to follow-up with participants at a later date. The principle investigator also offered assistance with completion of the contact information after the presentation or distribution of safety information. Some individuals had difficulty with their vision or their ability to complete the demographic

survey. The principle investigator assisted these individuals and filled out this information for these individuals. The investigator the card out loud to the participant and recorded responses, if any, were reported. Piekarski and Cralley (2000) indicated that "significant improvements in response rates can be achieved by utilizing a more rigorous calling methodology that includes more than 4 call attempts" (p. 4).

Of the 106 individuals included in this study, 86 of the participants were females and 20 of the participants were male. The larger inclusion of females in this study was due to the fact that more females were present for the presentation or distribution of educational materials. This discrepancy may be a consequence of the longevity of women compared to men, the fact that that women fall more frequently than men, and that women are more likely to incur fractures when they fall (World Health Organization, 2004).

Of the 106 individuals included in this study, 83 individuals were Caucasian and 23 of these individuals were other minority, non-white. According to Florida population estimates there were 1,961,797 Caucasian and 193,617 non-white individuals 60 years of age and older residing in the State of Florida (http://www. floridacharts.com/ charts/population.aspx). This discrepancy among groups could also be accounted for by the location of the senior center or that "Caucasian ethnic groups fall more frequently than Afro-Carribeans, Hispanics or South Americans" (World Health Organization, 2005, p. 7). Participant demographics are listed in Table 4.1. Of the 106 individuals included in this study, 64 individuals received the intervention. A total of 49 females and 15 males received the intervention. Of the 64 individuals who received the intervention, 48 were Caucasian and 16 were other minority, non-white.

Of the 106 individuals included in this study, 42 individuals received the informational brochure. A total of 37 females and 5 males received the informational brochure. Of the 42 individuals who received the informational brochure, 28 were Caucasian and 14 were other minority, non-white.

Table 4.1 Group Membership and Demographics (N=106)

Group Membership	Female	Male	White	Other minority, non-white
Both Groups (N=106)				
n	86	20	76	30
%	81.1	18.9	71.1	28.3
Intervention (N=64)				
n	49	15	48	16
%	76.6	23.4	75	25
Brochure (N=42)				
n	37	5	28	14
%	88.1	11.9	66.7	33.3

Survey Results

The participants in this study were asked if they had any concerns about falling. A total of 76 individuals reported that they did have concerns about falling and 26 individuals reported that they did not have concerns about falling. One individual did not answer this question. Participants were asked if they had fallen at any time during the past five years. A total of 70 participants reported that they had fallen sometime during the past five years and 35 individuals reported that they had not sustained a previous fall. One individual did not answer this question.

Participants were asked if they were willing to make changes or improvements in their lives to prevent falling. A total of 99 individuals reported that they would be willing to make improvements and five individuals reported that they would not be willing to

make improvements in their lives to reduce their risk of falling. Two individuals did not answer this question.

Participants were asked if they had someone who would be available to assist them with making safety improvements. A total of 75 individuals reported to have an individual who would help them make safety improvements and 28 individuals reported that they did not have someone in their life to assist them with making improvements. Three individuals did not answer this question. A summary of these questions is presented in Table 4.2.

A total of 105 individuals answered the survey question regarding having concerns about falling. Seventy-six of these individuals reported that they had concerns about falling and 29 individuals indicated that they did not have such concerns. Of these individuals, a total of 12 males and 64 females reported to have concerns. Eight males and 21 females indicated that they did not have concerns about falling. A summary of these questions is presented in Table 4.2.

Participants in this study were asked if they had fallen at anytime during the past five years. A total of 105 individuals responded to this survey question. Seventy of these individuals reported to have taken a fall at some time during the past five years. Of these 70 individuals, 11 were male and 59 were female. A summary of these questions is presented in Table 4.2.

Participants in this study were asked if they were willing to make safety improvements to reduce fall risk and related injury. A total of 104 individuals responded to this survey question. Of the individuals who responded, a total of 19 males and 80 females indicated that they were willing to make safety improvement changes to reduce

fall risk and related injury. A total of one male and four females indicated that they would not be willing to make such changes. A summary of these questions is presented in Table 4.2.

Participants in this study were asked if they had the presence of an individual to assist them with making safety improvement changes. A total of 103 individuals responded to this survey question. Of the participants who responded, a total of 11 males and 64 females indicated that they had someone who would be able to assist them with making safety improvement changes. A total of eight males and 20 females reported that they did not have anyone to assist them with making safety improvement changes. A summary of these questions is presented in Table 4.2.

Table 4.2 Survey Results and Gender

Survey Question	**N**	**%**	**Male**	**%**	**Female**	**%**
Do you have concerns about falling? (n=105)			(n=20)		(n=85)	
Yes	76	71.7%	12	60	64	75.3
No	29	27.4%	8	40	21	24.6
Have you fallen in the past five years? (n=105)						
Yes	70	66.0%	11	55	59	69.4
No	35	33.0%	9	45	26	30.6
Are you willing to make safety improvement changes to reduce you chances of falling? (n=104)						
Yes	99	93.4%	19	95	80	94.1
No	5	4.6%	1	5	4	4.61
Do you have someone who will help you make these safety improvement changes? (n=103)						
	75	70.8%	11	55	64	75.3
Yes	28	26.4%	8	40	20	23.5
No						

Participants were also asked to review the safety brochure (refer to Appendix B) and list two safety improvement changes that they intended to make in the future.

Individuals were then asked during the follow-up survey if they had performed these safety improvements to reduce risk factors associated with falls. A total of 136 safety improvement changes were reported to have been made by participants, and of these, a total of 68 safety improvements were not carried out or performed. A total of eight individuals did not answer this question or recall if they had made or intended to make any safety improvements. These results are summarized in Table 4.3.

Table 4.3 Safety Improvement Changes (n=204)

Safety Improvement Changes	N	%
Change Made	136	66.6%
Change not Made	68	33.3%

Of the changes that were made, a total of 50 individuals reported making two safety improvement changes. Fifteen of these individuals were male and 42 were female. Of the individuals who reported making two changes, a total of 43 of these individuals were Caucasian and 14 of these individuals were other minority, non-white.

Of the changes that were made, a total of 22 individuals reported making one safety improvement behavior change. Four of these individuals were male and 18 were female. Of these individuals, a total of 15 participants were Caucasian and seven participants were other minority, non-white.

A total of 23 individuals reported that they did not make one or two safety improvement changes. Of these individuals, all were female, with no males reporting absence of a behavior change. Of these 23 females, 15 were Caucasian and eight were other minority, non-white.

Table 4.4 Combined Changes

Changes Made	Two Changes (n=57)	Two Changes %	One Change (n=22)	One Change %	No Changes (n=23)	No Changes %
Gender						
Male	15	26.3	4	18.2	0	0
Female	42	73.7	18	81.8	23	100.0

Table 4.4. Continued

Changes Made	Two Changes (n=57)	Two Changes %	One Change (n=22)	One Change %	No Changes (n=23)	No Changes %
Ethnicity						
Caucasian	43	75.4	15	68.2	15	65.2
Other minority, non-white	14	24.6	7	31.8	8	34.6
Combined Changes						
Caucasian and Male	11	73.3	2	50.0	0.0	0.0
Other minority and Male	4	26.7	2	50.0	0.0	0.0
Caucasian and Female	32	76.2	13	72.2	15	65.2
Other minority and Female	10	23.8	5	27.8	8	34.6

Fifteen male participants received the intervention. Of these participants, nine white males and three other minority, non-white males indicated that they made two safety improvement changes. Of these 15 males, two white males and one other minority, non-white male reported to have made one safety improvement change. A summary of these questions is presented in Table 4.5.

Five male participants reported making safety improvement changes after receiving the informational brochure. A total of three males made two safety improvement changes and two males indicated that they had made one safety improvement change. A summary of these questions is presented in Table 4.5.

A total of 27 white females reported making two changes and four females indicated that they had made one safety improvement change after receiving the

intervention. A total of seven other minority, non-white females indicated that they made two changes and one female indicated that they had made one safety improvement change. Nine individuals who received the intervention reported to have made no changes. Of the 25 white females who received the informational brochure, five indicated that they had made two changes, nine indicated that they had made one change, and ten indicated that they had made no safety improvement changes. Of the 12 females who were other minority, non-white, three indicated that they had made two changes, four reported to have made one change, and four indicated that they had made no safety improvement changes. A summary of these questions is presented in Table 4.5.

Table 4.5 Group Membership and Change

	Intervention (N=64)	Brochure (N=42)
Male: Caucasian	11	3
Both Changes	9	2
One Change	2	1
No Change	0	0
Male: other Minority, non-white	4	2
Both Changes	3	1
One Change	1	1
No Change	0	0
Female: Caucasian	37	25
Both Changes	27	5
One Change	4	9
No Change	5	10
Female: other Minority,non-white	12	12
Both Changes	7	3
One Change	1	4
No Change	4	4

Logistic Regression

Regression models have become "an integral component of any data analysis concerned with describing the relationship between a response variable and one or more explanatory variables" (Hosmer & Lemeshow, 2000, p. 1). As with the goal of any

analysis, it is important to find and use the most appropriate method that describes the relationship between the dependent and independent variables. When an outcome variable is discrete "the logistic regression model has become, in many fields, the standard method of analysis in this situation" (p. 1). Logistic regression is distinguishable from the linear regression model when the outcome variable is dichotomous. Therefore, a logistic regression was the chosen method of analysis that accompanied this study.

A multiple logistic regression analysis was conducted to determine whether the values of the groups or the independent variables affected the probability of an individual reducing their risks of falling through safety improvement behavior change. Of the 106 participants who were eligible for inclusion into this study, seven participants did not answer every survey question. Therefore, the N for the logistic regression was 99. Specifically, this regression explored the differences in the probability of safety improvement behaviors performed between the intervention and comparison groups. Research Hypothesis 1.0: There will be a difference in behaviors between the intervention and the comparison groups.

A logistic regression was used to test whether the proportion of safety improvement changes (H_0: p intervention $\leq$ p comparison, $\alpha \leq .05$) was the same for participants who attended HeadSmartz, a Cranium Challenge (intervention) in comparison to participants who only received the educational brochure (comparison). The Wald chi-squared test statistic associated with this test was 3.877 with one degree of freedom, and the p-value was reported to be 0.049. Therefore, the two groups were found to have significant differences in the probability of safety improvement behavior changes that were made by members of the intervention group when compared to individuals who

only received the educational packet (X^2=3.877, df=1, p= 0.049). Therefore, the null hypothesis was rejected and it was concluded that there were differences in the probability of making a safety improvement change between the intervention and comparison groups. These results are summarized in Table 4.6.

Research Hypothesis 2.0: Having concerns about falling will be related to behavior change.

A logistic regression was used to test whether individuals' concerns about falling (covariate) were an important covariate in predicting the probability of safety improvement behavior changes made by participants in the intervention and comparison groups. The Wald chi-square test statistic associated with this test was 0.475 with one degree of freedom, and the p-value was reported to be 0.490 Therefore, having concerns about falling was not a significant covariate in predicting the probability of safety improvement change made by members of the intervention or comparison groups (X^2= 0.475, df= 1, p= 0.491 , $\alpha \leq .05$). Therefore, the null hypothesis was not rejected and it was concluded that having concerns about falling do not increase the probability of making a safety improvement change or not making a change. These results are summarized in Table 4.6.

Research Hypothesis 3.0: Having a history of previous falls will be related to behavior change.

A logistic Regression was used to test whether individuals who had a history of previous falls (covariate) was an important covariate in predicting the probability of safety improvement behavior changes made by participants in the intervention and comparison groups. The Wald chi-square statistic associated with this test was 0.064 with

one degree of freedom, and the associated p-value was 0.80. Therefore, having a history of previous falls was not a significant covariate in predicting the probability of safety improvement changes made by members of the intervention or comparison groups (X^2= 0.064, df=1, p= 0.80, $\alpha \leq .05$). Therefore, the null hypothesis was not rejected and it was concluded that having a history of previous falls does not increase the probability of making a safety improvement change or not making a change. These results are summarized in Table 4.6.

Research Hypothesis 4.0: The willingness to perform safety behavior changes will be related to behavior change.

A logistic regression was used to test whether individuals who reported that they were willing to make safety improvement changes (covariate) was an important covariate in predicting the probability of safety improvement behavior changes made by participants in the intervention and comparison groups. The Wald chi-square statistic associated with this test was 0.541 with one degree of freedom, and the associated p-value was 0.462. Therefore, having a willingness to perform safety behaviors was not a significant covariate in predicting the probability of safety improvement changes made by members of the intervention or comparison groups (X^2=0.541, df=1, p= 0.462, $\alpha \leq$ .05). Therefore, the null hypothesis was not rejected and it was concluded that being willing to make safety improvement changes does not increase the probability of making a safety improvement change or not making a change. These results are summarized in Table 4.6.

Research Hypothesis 5.0: Gender will be related to behavior change.

A logistic regression was to test whether being a male or a female (covariate) was an important covariate in predicting the probability of safety improvement behavior change made by participants in the intervention and comparison groups. The Wald chi-square statistic associated with this test was 0.000 with one degree of freedom, and the associated p-value was 0. 998. Therefore, being either male or female was not a significant covariate when predicting the probability of safety improvement changes made by members of the intervention or control group (X^2= 0.00, df=1, p= 0.998, $\alpha \leq$ .05). Therefore, the null hypothesis was not rejected and it was concluded that gender is not related to the probability of making a safety improvement change or not making a change. These results are summarized in Table 4.6.

Research Hypothesis 6.0: Ethnicity will be related to behavior change.

A logistic regression was to test whether being Caucasian or other minority non-white (covariate) was an important covariate in predicting the probability of safety improvement behavior changes made by participants in the intervention and comparison groups. The Wald chi-square statistic associated with this test was 0.620 with one degree of freedom, and the associated p-value was 0.431. Therefore, being Caucasian or other minority non-white was not a significant covariate when predicting the probability of safety improvement changes made by members of the intervention or comparison groups (X^2=0.70, df=1, p= 0.40, $\alpha \leq .05$). Therefore, the null hypothesis was not rejected and it was concluded that ethnicity is not related to the probability of making a safety improvement change or not making a safety improvement change. These results are summarized in Table 4.6.

Research Hypothesis 7.0: Having an individual to assist with making safety changes will be related to behavior change.

A logistic regression was to test whether having an individual to assist with making safety improvement changes (covariate) was an important covariate in predicting the probability of safety improvement behavior changes made by participants in the intervention and comparison groups. The Wald chi-square statistic associated with this test was 0.600 with one degree of freedom, and the associated p-value was 0.439. Therefore, having an individual to assist with making safety improvements was not a significant covariate when predicting the probability of safety improvement changes made by members of the intervention or control group (X^2= 0.600, df=1, p= 0.439, $\alpha \leq$ .05). Therefore, the null hypothesis was not rejected and it was concluded that having the presence of an individual to help is not related to the probability of making a safety improvement behavior change or not making a change. These results are summarized in Table 4.6.

The Hosmer and Lemeshow goodness of fit test statistic tests the null hypothesis to assess the fit of the model data. A Hosmer and Lemeshow test reported with this study was 0.714. This indicated that the model's estimates to fit the data are at an acceptable level. The Cox and Snell R-square and the Nagelkerke's R-square estimates were also reported. These values were 0.168 and 0.256 respectively. In sum, the approximate percent of variance among all of the variables included in the logistic regression was between 16.8% and 25.6%.

Table 4.6 Summary of Logistic Regression

Variable	DF	B	S.E.	Wald Chi-Square	p-value $\alpha \leq .05$	Odds Ratio [Exp(B)]
Independent Variable: Group Membership	1	-1.118	0.568	3.877	0.049	0.327
Covariate: Concerns	1	-0.473	0.686	0.475	0.490	0.623
Covariate: History	1	-0.168	0.663	0.064	0.800	0.845
Covariate: Willingness	1	0.968	1.316	0.541	0.462	2.631
Covariate: Help	1	-0.471	0.607	0.600	0.439	0.625
Covariate: Gender	1	20.266	9176.018	0.000	0.998	< 0.001
Covariate: Ethnicity	1	-0.467	0.483	0.620	0.431	0.627

Summary of Results

Logistic regression, which models the probability of change as a function of covariates and independent variables, was used to test whether the probability of making a safety improvement change was the same for individuals who received the Be HeadSmart®Seniors! fall prevention intervention compared to individuals who only received the safety information. A logistic regression analysis was the method of analysis used to determine which variables affected the probability of a participant making a safety improvement behavior change or not making a change. The results of this study indicated that the intervention was useful for predicting the probability of making or not

making safety improvement changes. Gender was found to be a non-significant covariate when predicting the probability of making or not making safety improvement changes made by members of the intervention and comparison groups. Ethnicity was tested to determine if an individual's ethnic or cultural affiliation would be an important covariate in predicting the probability of making or not making safety improvement changes. Results of the Wald chi-square statistic indicated that ethnicity was not a significant covariate in predicting the probability of making or not making safety improvement changes. Having concerns about falling was not a significant covariate when predicting the probability of making or not making safety improvement changes. Another covariate, having a history of previous falls, was not a significant covariate when predicting the probability of making or not making safety improvement changes. A logistic regression was used to determine if an individual's willingness to perform safety behavior changes would be an important covariate in predicting the probability of making safety or not making safety improvement changes. The results of this study indicate that a willingness to perform safety behaviors was not a significant covariate when predicting the probability of making or not making safety improvement changes.

CHAPTER 5
DISCUSSION

The results of the preceding analyses indicated that the Be HeadSmart® Seniors! fall prevention intervention was successful in promoting safety improvement behavior changes. This discussion examines the results of the analysis and relates these findings to the literature reviewed in Chapter 2. This study supported Rowe and Kahn's (1997) model of successful aging which emphasizes active engagement with interpersonal relations and productive activity. This study also supported the basic components of DiClemente and Prochaska's (1998) Transtheoretical Model of Behavior change by motivating and engaging individuals in the intervention group to make safety improvement behavior changes.

The relationship between active engagement with life and the functioning of older adults was examined by Everard et al. (2000) and included "both activity and social support" (p. S209). Their study included leisure activities in addition to social and productive activities. They also examined the relationship of engagement, as activity and social support, and compared it to "the functioning in older adults" (p. S209). They argue that "the relationship of activity to social support and functioning can be important in the development of early interventions to prevent disability or enhance successful aging" (p. S209). Findings in their study revealed that there is a relationship between active engagement and functioning. Maintenance of social, leisure, and instrumental activities were associated with better functioning.

The authors suggest that these findings indicate that activity may be a modifiable factor in successful aging, and that disability and health care costs could be reduced when utilized with an early intervention.

The Transtheoretical Model of behavior change (TTM) developed originally from a comparative analysis of behavior change and psychotherapy. This model "is a comprehensive psychological model that integrates important constructs from other behavioral theories with an innovative approach to conceptualizing behavior change as occurring in distinct stages" (Fahrenwald & Walker, 2003, p. 307). The TTM was initially applied to psychotherapy, and later applied to smoking cessation, other addictive behaviors, exercise and physical activity promotion interventions, and various aspects of dietary change. Over the last decade, the application of the model has rapidly expanded to include a broad range of health behaviors (Rossi & Rossi, 1999).

The TTM integrates behavior change constructs with the core construct stages of change which includes self-efficacy defined as "the beliefs a person hold regarding their abilities to perform an action" (Fahrenwald & Walker, 2003, p. 308). Behavioral processes of change have been cited as being "most important when initiating and performing health behavior" (p. 309). Therefore, the conceptual framework based upon a combination of the model for successful aging (Rowe & Kahn, 1997) and Prochaska and DiClemente's Transtheoretical Model of Change supports the significant results of the intervention that was tested in this study. Participants who received the intervention attended the presentation, participated in HeadSmartz, a Cranium challenge, and received safety information.

Individuals who received the intervention reported to have made more safety improvement behavior changes when compared to individuals who only received the safety information.

Fall Intervention and Prevention Programs

An impact evaluation of a falls prevention program among older people, "Up and About", was conducted in Australia in 1999. The primary goal of this study was to examine the impact of education sessions on older people's fall-related attitudes and behavior. The material presented during these information sessions focused on raising awareness about falls and prevention. Similar to the intervention used in this study, members of the intervention group attended educational information sessions that focused on raising awareness or changing behavior attitudes in fall prevention, risk factors for falling, and modifying hazards in the home or yard to prevent falls (Deery, Day, & Fildes, 2000). Members assigned to the control group did not attend the informational sessions. The results of the "Up and About" program mirrored the results of the Be HeadSmart Seniors! intervention. "Up and About" participants who attended the informational session reported installing more fall prevention features in their home or yard, and reported taking more fall prevention actions when compared with the control group.

The results of the "Stepping On" program (2004) also supports the effect of a fall intervention program on reducing falls. The aim of this program was to facilitate "improve self-efficacy, encourage behavior change and reduce falls" (Clemson et al., p. 1487). Similar findings were reported in studies by Stevens, Holman, and Bennett (2001) and Yates and Dunnagan (2001).

In a study by Hornbrook et al. (1994), an intervention that encouraged participants to adopt behavioral strategies to promote safety in their environment was examined. The results of this study indicated that the intervention group experienced only marginal decreases in the average number of falls sustained by participants. Other intervention methods in fall prevention programs, such as home assessment and exercise, have not been significant in reducing the number of falls experienced by senior citizens. A randomized control trial to prevent falls was implemented to evaluate a home assessment, which included information on hazard reduction and the installation of safety devices in individual's homes. Members of the control group did not receive any form of intervention. The results of this study indicated "the intervention failed to achieve a reduction in the occurrence of falls" (Stevens et al., 2001, p. 1448). Similar results were found in studies by Reinsch et al. (1992) and Peel et al. (2000). In sum, previous fall prevention intervention studies have been inconsistent in outcome and significance.

Concerns About Falling

Participants in the intervention and comparison group were asked if they had concerns about falling. The psychological effects associated with falling often result in "a fear of falling which in itself is a risk factor for future falls and can greatly reduce an individual's quality of life" (Casteel et al., 2004, p. S52). A logistic regression indicated that having concerns about falling was not a significant covariate when predicting the probability of safety improvement behavior changes made by members of either group. Of the 106 participants included in this study, 71.7% (n=76) of individuals reported that they had concerns about falling, but the results of this study found this covariate to be non-significant in predicting the probability of safety improvement behavior change

regardless of receipt of the intervention. These findings are similar to the results found in the study by Reinsch et al. (1992). The results of their study did not indicate any differences between the control or intervention groups in the occurrence of falls or fears associated with falling.

An education and activity intervention program was implemented in Kingston, Canada to determine "the relative effect of these programs on fear of falling, balance, strength, and health status" (Brouwer et al., 2003). Participants were randomly assigned to an activity group or an education group. Members in the activity group attended eight one-hour exercise sessions. Members in the education group engaged in group discussions about their concerns regarding falls and "on topics pertaining to identifying and reducing risk factors of falls" (p. 830). The major finding in the study conducted by Brower et al. (2003) is that fear of falling can be reduced by both activity and education programs. Having concerns about falling, regardless of fall status, can lead to deterioration in perceived health status and is associated with poor social function that threatens autonomy and quality of life (as cited in Brouwer et al., 2003, p. 833). According to Tinetti (1994), fear of falling may adversely affect functional independence and is common among elderly persons who have, and have not, experienced a fall (p. 756). In sum, having concerns or fears about falling can have negative consequences which can affect an individual's ability to have an active engagement with life. Therefore, the non-significant findings of the predictive quality of having concerns about falling and consequential behavior change do not support the conceptual framework of this study.

History of Previous Falls

One hundred six participants in this study were asked if they had fallen at any time during the past year. A total of 66% (n=70) of individuals reported to have fallen during the past five years. A logistic regression was used to determine if a history of previous falls was an important covariate in predicting the probability of safety improvement behavior changes made by members of the intervention and comparison groups. The results of the Wald chi square test indicated that having a history of previous falls was not a significant covariate in predicting the probability of safety improvement changes.

Independent risk factors associated with falling include a history of previous falls and fall injuries (Tinetti, 1994). A review of the literature indicated that having a history of previous falls increases the risk of a future fall which has be linked to a fear of falling, limitation of activity, and functional decline (Tinetti, 1994). As mentioned earlier, a history of previous falls may lead to a fear of falling. According to Delbaere et al. (2004), one of the major consequences of fear of falling and the history of previous falls is "the restriction and avoidance of activities, but this may lead the elderly to become more cautious, which may be functional in preventing falls" (p. 368). This author reports that only a small percentage of elderly display a pattern of excessive fear and a restriction of activities. Upon extensive review of the literature, it was concluded that there is a lack of evidence directly linking a history of falls and safety improvement behavior. This will be explored further in the suggestions for future research later in this chapter.

Willingness to Make Safety Improvement Changes

Participants in this study were asked if they were willing to make safety improvement changes to avoid a fall and consequential injury. A total of 93.4% (n=99) of individuals reported that they would be willing to make safety improvement changes. A logistic regression was used to determine if an individual's willingness to make safety improvements was an important covariate in predicting the probability of behavior changes made by individuals of the intervention and comparison group. Results of this study indicated that having a willingness to make safety improvements was not a significant covariate when predicting the probability of safety improvement changes.

The Transtheoretical Model (TTM) has been used to "understand the stages that older adults progress through when changing behavior, and the cognitive and behavioral processes that are used to influence health behaviors" (Resnick & Nigg, 2003, p. 81). Previous research using the TTM has shown that as individuals move through the stages of change they report more behaviors and had stronger self-efficacy expectations (Resnick & Nigg, 2003). Self-efficacy refers to an individual's belief in their ability to perform a behavior. Literature has indicated that elders who have high self-concepts and high levels of self-efficacy often perform actions to improve their situations (Tinetti et al., 1990). Therefore, individuals who have higher rates of self-efficacy can potentially have a more active engagement with life and more success with aging. If an individual is willing to make changes in their life to be more proactive about their safety, they may also have a higher sense of self-efficacy and be more likely to perform actions to reduce their chances of falls and related injury.

Results of the logistic regression in this current study were found to be non-significant in the prediction of the probability of safety improvement behavior changes made by members of the intervention and comparison groups.

Assistance with Making Safety Improvements

Participants in this study were asked if they had the presence of an individual to assist them with making safety improvement changes. A total of 70.8% (n=75) individuals indicated that they had someone to assist them with making improvements. A logistic regression was used to test whether the presence of an individual to assist with making changes was an important covariate in predicting the probability of behavior changes made by members of the intervention and comparison groups. The results of this test indicated that the presence of an individual to assist the participant in making safety improvement changes was not a significant covariate when in predicting the probability of behavior change.

Findings in a study by Newsom et al. (2004) found that few adults have made attempts to improve their health, and that many of these individuals did not feel that they needed to make health improvements. The results of their study indicated older individuals may lack the power and support to make these changes. Social relationships and support have strong influences on and individual's health and well-being. It has been "noted that isolation, bereavement, and lack of social integration are related to increased mortality risk" (Berkman, Oxman, & Seeman, 1992, p. 196). Falls and related injury are a result of mortality risk. The lack of a social support system has also been linked to a higher rate of falls among the elderly (Tideiksaar, 2003).

Instrumental or tangible support is defined as having an individual available to assist with daily tasks and transportation and it is likely that specific kinds of support will be related to specific outcomes, which may in turn promote health and optimal levels of functioning (Berkman et al., 1992). It is also important to mention that not all social support promotes health. For example, social support that increases the older person feelings of low self-esteem, lack of competence, or autonomy and dependence may be potentially damaging (Berkman et al., 1992). In sum, social support can increase or decrease an individual's health, well-being, and self-efficacy, which may promote or discourage behavior change.

Gender

Of the 106 individuals included in this study, 81.1% of the participants were female (n=86) and 18.9% of these individuals were male (n=20). A logistic regression was used to test whether an individual's gender was an important covariate in predicting the probability of behavior changes made by members of the intervention and comparison groups. The results of this study indicated that gender is not a significant covariate when predicting the probability of behavior change.

Current trend data indicate that women fall more frequently when compared to men. According to Stevens and Sogolow (2005), non-fatal fall-related injuries disproportionately affect older women. Previous studies have examined the predictors of positive health behaviors among older adults. One study discovered that females tended to have better health behaviors when compared with men (Brown & McCreedy, 1986). In addition, women with stronger social support networks engaged in more positive health

behaviors (Gallant & Dorn, 2004). Improved and more frequent health behaviors of men were correlated with higher socioeconomic status and being married.

Ethnicity

Of the 106 individuals included in this study, 71.1% of the participants were Caucasian (n= 76) and 28.3 % of these individuals were classified as other minority, non-white (n=30). A logistic regression was used to test whether an individual's ethnicity was an important covariate in predicting the probability of behavior changes made by members of the intervention and comparison groups. The results of this study indicated that ethnicity was not a significant covariate when predicting the probability of safety improvement behavior change.

There is little research pertaining to the influence of ethnicity on health practices. This is primarily "because non-white individuals are not well represented in most study samples" (Gallant & Dorn, 2001, p. 22). Among minority elders, there is a lack of knowledge about all types of health promotion and behavior practices and this is a serious gap in the literature (Davis & Wykle, 1998). The limited literature that is available has shown that "being white is associated with greater preventative behavior" (Gallant & Dorn, 2001, p. 22). In the study by Gallant and Dorn (2001), gender and race differences in the prediction of health behaviors among older adults were examined. Results of their study indicated that "influential forces on preventative health behaviors vary to a considerable degree for men and women and for blacks and whites" (p. 30). There is a strong need for more research addressing health behavior change examining ethnic differences.

The examination of the research hypotheses examining ethnicity and safety improvement behavior changes in this study supports evidence found in previous research.

Summary

Overall, the findings in this study supported the usefulness of the Be HeadSmart® Seniors! fall intervention in promoting safety improvement behavior change. These findings support previous research that fall prevention programs must include effective strategies to promote behavioral changes and reduce fall risks (Stevens & Olson, 2000). Gallant and Dorn (2000) stated that preventative health behaviors are crucial for older adults well being and that there is a need for a greater understanding of factors that are associated with these behaviors.

Results of this study indicated that participants who received the fall-prevention intervention reported a higher proportion of safety improvement behavior changes when compared to individuals who only received educational information. Knowledge of fall risk factors has been associated with fall prevention behavior (Brown et al., 2005). The reduction of the risks associated with falling and the associated behavior change is a complex and multi-faceted process. The results of the logistic regression performed in the present study supports that effective fall prevention strategies need to incorporate a dynamic approach with both behavioral and environmental components (Stevens & Olson, 2000). This also is supported by previous work by Brown et al. (2005), who found that the use of a multicomponent change strategy can be successful in promoting behavior change, even in areas as complex and multi-factorial as fall prevention and intervention.

Implications for Future Research

The results of this study show that a fall prevention intervention with a unique psycho-educational approach can be successful in promoting safety improvement behavior change. There is a need to continue examination of this intervention and examine its efficacy to reduce falls and fall risk. In addition, this fall intervention is tailored to include information about Traumatic Brain Injury. Currently, the Brain Injury Association of Florida (BIAF) is providing free training to health and safety professionals throughout the State of Florida. These individuals attend an hour-long training session, which includes completion of a pre-test, an introduction to traumatic brain injury Power Point presentation, and a post-test. Individuals are also required to attend a HeadSmartz event. Trained presenters are provided with assistance for presenting their first event and setting up future events. The individual who trained the presenters facilitates their first event by assisting them with the delivery of the presentation and the distribution of materials and promotional items. Trained presenters are provided with all safety information materials and promotional items free of charge. These presenters are required to complete an Event Tracking form, which includes the date and location of their event, the number of attendees, and the number of safety improvement cards that were collected. This form and the completed cards are sent to BIAF. Continuation of the training of safety and health professionals could facilitate this program's delivery to more seniors throughout the State of Florida.

This study should be repeated with an expanded survey instrument that would include awareness and knowledge of TBI. Falls are the leading cause of TBI and 1.4 million people sustain a TBI each year (Brain Injury Association of America, 2005). A

larger, more representative sample should be used and include adequate participants in regards to gender and ethnicity. Additional survey components could include information about age, socioeconomic status, and level of education. Previous studies have indicated that these factors influence health behavior change (Newsom et al., 2004). This study could be expanded to include exploration of possible reduction in fall related injury and consequential TBI. Data from the State of Florida injury surveillance system could be analyzed and reviewed by exploring TBI incidence and prevalence. Counties in which the Cranium Challenge is delivered could be analyzed, compared, and contrasted.

This study could also be expanded to include caregiver knowledge about traumatic brain injury and fall prevention. The role of the caregiver is an important area that should be addressed by future research. This study should be replicated with caregivers using a tailored intervention that includes educational information about TBI and fall prevention.

Limitations and Strengths

This study has several limitations that should be addressed. Participants were recruited for this study through self-selection. The type of sampling and group assignment used in this study is associated with a bias for self-selection. The type of sampling strategy utilized in this study incorporated the use of nonequivalent posttest-only comparison group design. This strategy facilitated static group comparison and allowed for the identification of confounding factors that were present in this study. Static comparison did allow for some measure of comparison in that it included a comparison group. Historically, this type of comparison has been viewed as being inherently weak for the illumination of causal relationships. This is a consequence of threats to internal

validity, due to selection bias and attrition, and the lack of group equivalence before implementing an intervention.

The sample of participants in this study consisted mostly of white females. The sample is not representative of the population. Participants were contacted through a telephone follow-up survey. Some participants were excluded from the study due to a lack of a telephone or because they could not recall their telephone number. Similarly, these individuals may have wanted to please the interviewer and could have over- or under-reported safety improvement behavior changes (response bias). Safety improvement changes were self-reported and there was no mechanism implemented to verify that safety improvements were made. Individuals who participated in this study had access to transportation to the senior center and the ability to attend events at the senior center. Individuals who did not have access or the ability to attend events at a senior center were not included in this study; therefore, this sample was not a representative sample of community-dwelling elders.

There are a number of strengths associated with this study. Senior Community Centers provide nutritious meals, social activities, health and consumer education, and other services to senior individuals in the community. These sites were chosen to increase the likelihood that individuals attending these centers would be more diverse and representative of the senior population.

The use of logistic regression added rigor to this study. A logistic regression analysis accompanied this study and was conducted to determine whether the values of the groups or covariates affected the probability of an individual performing a safety improvement change. The Wald chi-square test was performed and reported to indicate

significance of individual independent variables. Maximum likelihood estimates (MLE) and the odds ratio were also reported.

Conclusion

This study used logistic regression to determine whether the number of safety improvement changes that were made were the same for participants who attended HeadSmartz, a Cranium Challenge (intervention), in comparison to participants who only received educational information (comparison). Results of the analyses found that the Be HeadSmart®Seniors! fall intervention group had a significantly higher proportion of individuals making safety improvement behavior changes. Having concerns about falling, reporting a history of previous falls, being willing to make safety improvement changes, and having the presence of an individual to assist with making changes were not significant covariates when predicting the probability of safety improvement changes made be individuals in the intervention and comparison groups. This study supports previous research that showed that the use of a multicomponent change strategy can be successful in promoting behavior change, even in areas as complex and multi-factorial as fall prevention and intervention.

APPENDIX A.
MAKE A DIFFERENCE SURVEY CARD

Be HeadSmart®.

Seniors!

Make a Difference!

Open and review the Be HeadSmart Safety Checklist.

Find one or two things you can do to reduce your risk of serious injury.

Write them below with your name, telephone and zip code.

My Safety Improvements: (Please Print)
1.
2.
Name:
Telephone:
Zip Code:
Age Group: ☐ **60 + up** ☐ **under 60**

Brain Injury Association of Florida may call after receiving this card to follow up on your progress in making safety improvements that ***Make A Difference***. (This is not a solicitation - responses are for evaluation purposes only)

Prevention **is the only cure for Traumatic Brain Injury**

Brain Injury Association of Florida, Inc.

Event Date	Location	Presenter

The Be HeadSmart® Safety Checklist

Use this handy checklist to identify potential improvements to your home and your life.

MY HOME

Stairways, Hallways and Entrances

- ❒ Stairs / stair coverings are in good repair.
- ❒ Handrails are sturdy and run the full length of stairways
- ❒ Stairways, hallways and entrances are well lit indoors and out
- ❒ Stairways, hallways and entrances are kept free of clutter
- ❒ Sidewalks and walkways are level and free of cracks or holes

Living Areas

- ❒ I can turn on a light in each room without having to walk through the dark
- ❒ Nightlights are used, especially between the bed and bathroom
- ❒ Cords and wires are not stretched across pathways or under rugs
- ❒ Carpet, tile, and floorboards lie flat and are in good repair
- ❒ I do not use loose rugs or unsecured mats in or around my home
- ❒ Area rugs have non-slip backing or are secured with double-sided tape
- ❒ Furniture is arranged to prevent tripping and pathways are kept clear
- ❒ Work and storage areas are organized so they are within easy reach.
- ❒ There is always a phone within easy reach. Emergency numbers are posted
- ❒ I always use a sturdy stepstool or ladder to reach high places - never a chair

MY HOME (continued)

Bathrooms

- ❒ Tubs and showers have a non-skid mat, decals, abrasive strips or non-slip surface
- ❒ Sturdy grab bars or handrails are installed by the toilet and in tubs and showers
- ❒ Tub seat, hand-held shower and/or raised toilet seat with arms are used if needed
- ❒ Bathroom rugs have non-skid backing Bathroom floors have a non-slip surface

Bedroom

- ❒ I keep a working flashlight and telephone by the bed
- ❒ There is a light switch or lamp within reach of the bed
- ❒ The bed is at the proper height to allow easy access

MY LIFESTYLE

Getting Around

- ❒ I wear supportive, low-heeled, non-slip shoes - even at home
- ❒ In wet weather I wear non-slip boots or shoes and avoid slippery surfaces
- ❒ I pay attention to floors in public buildings especially if they are waxed or wet
- ❒ I am always aware of traffic and traffic signals when crossing the street
- ❒ When getting out of a vehicle, I take my time especially if the ground is uneven
- ❒ If recommended by my health care provider, I use my cane, walking stick or walker

MY LIFESTYLE (continued)

Driving

- ❒ I have completed a safe driving class to keep my skills sharp
- ❒ I avoid driving at night, and take frequent rest stops on long trips
- ❒ I ALWAYS wear my seat belt and insist my passengers do, too
- ❒ I keep a safe distance between my car and the car in front of me
- ❒ I use my turn signals to let drivers and pedestrians know what I intend to do

Health / In General

- ❒ My vision is checked on a regular basis
- ❒ I wear sunglasses on sunny days
- ❒ I have reviewed my medications with my doctor or pharmacist and discussed possible side effects or interactions
- ❒ My medications are clearly labeled and I take them only as prescribed
- ❒ I have a system to help me remember to take the correct dosage each day
- ❒ I eat nutritious, balanced meals with adequate calcium and vitamin D.
- ❒ I exercise regularly to maintain strength, balance and agility
- ❒ I engage in activities that stimulate my mind and keep my brain active
- ❒ I have an answering service or portable phone - I don't rush to answer the phone
- ❒ I have arranged for daily contact with a friend or family member
- ❒ I'm careful not to get up too quickly, especially after lying down, resting or eating

Falls are the leading cause of brain injury in Americans age 60 and up.

Car crashes are a close second.

One in three adults over age 65 falls each year.

60% of these falls occur at home.

WHAT CAN *YOU* DO TO REDUCE YOUR RISK OF SERIOUS INJURY?

Identify Potential Dangers — Use the checklist to take an objective look at your home and your lifestyle.

Make Improvements Where Needed — Don't underestimate how taking simple steps can help you avoid serious injury.

Be HeadSmart®, Seniors! — You can ***Make A Difference*** in your life and the lives of your loved ones.

MOST BRAIN INJURIES CAN BE PREVENTED.

BE PROACTIVE ABOUT YOUR SAFETY.

About Traumatic Brain Injury (TBI)

A blow to the head can disrupt the normal function of the brain. This can occur even when there is no visible damage. Concussion is the most common form of brain injury.

Often dubbed, "the hidden disability," TBI symptoms can be missed or misinterpreted by the individual, family members and even doctors. People may look fine even though they're acting or feeling differently.

Every brain injury is different because the brain is very complex. TBI can adversely affect many functions we take for granted every day, including speech, vision, balance, logic and memory.

After a brain injury/concussion, be alert for symptoms that may not show up for days or even weeks after the injury. An adult should go to the emergency room, see their doctor or call 911 if he/she experiences any of the following:

- Trouble answering simple questions
- A headache that gets worse even after medication
- Changes in personality or behavior
- Pupils (black center of the eye) are different sizes
- Stumbling or problems with balance
- Double vision, dizziness or slurred speech
- Seizures (convulsions)
- Blood or clear fluid from nose or ears
- Persistent vomiting

If you answer YES to the following questions, talk to your doctor about getting help.

Has there been a personality change?

Does the individual get angry for no reason?

Does the individual get lost or easily confused?

Does the individual have more trouble than usual making decisions?

Is there a significant drop in performance (work, sports, social, etc.)?

Are there problems in thinking processes (memory, concentration, learning, speaking or understanding)?

Be HeadSmart®, Seniors! is a project of the

Brain Injury Association of Florida, Inc.

201 E. Sample Road
Pompano Beach, FL 33064

954-786-2400
HELPLINE: 1-800-992-3442
www.biaf.org

working with community-based agencies and organizations to increase awareness of the risks and consequences of brain injury among Florida's older residents.

Brain Injury Association of Florida is a member of **FLIPS**
(Florida Injury Prevention Program for Seniors)
Florida Department of Elder Affairs

FLORIDA DEPARTMENT OF HEALTH

Brain & Spinal Cord Injury Program

The mission of the Brain & Spinal Cord Injury Program (BSCIP) is to provide all eligible Florida residents who sustain a traumatic brain or spinal cord injury the opportunity to obtain the necessary services enabling them to return to their community.

Be HeadSmart®, Seniors!

Tips and information to help protect your greatest resource - your brain!

Brain Injury.

IT'S THE LAST THING ON YOUR MIND... UNTIL IT'S THE ONLY THING.®

Brain Injury Association of Florida, Inc.
Be HeadSmart®, Seniors! Prevention Project

Sponsored by the Florida Department of Health Brain and Spinal Cord Injury Program.

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I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the Degree of Doctor of Philosophy.

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